

# DOMINION ENERGY SOUTH CAROLINA MARKET CHARACTERIZATION



## Dominion Energy South Carolina Nonresidential Market Characterization

December 7, 2022

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# 1. Executive Summary

This report summarizes the methodologies and key results for the nonresidential market characterization study in support of Dominion Energy South Carolina's (DESC's) Demand Side Management (DSM) Potential Study. The research objectives of this effort were developed in coordination with DESC and were refined based on feedback from Energy Efficiency Advisory Group (EEAG) stakeholders.

## 1.1 Study Objectives

The Market Characterization study objectives included several inputs into DESC's 2022 DSM Potential Study. This market assessment was geared toward providing potential model inputs that are well-grounded in DESC's customer base while also characterizing DESC's entire market in terms of energy efficiency (EE) opportunities and barriers.

The Market Characterization report addresses the following research questions:

- Who has participated in programs to date and who has not? What are the characteristics associated with participants vs. nonparticipants?
- Among nonparticipants to date, what are the size, annual energy usage, building, household/business, segment and geographic characteristics?
- How important is EE in decision-making for customers in light of all other priorities?
- How important is the utility bill in the customer's hierarchy of basic needs? For commercial customers, the utility bill is in relation to business operational needs including revenue, operating costs and profit.
- How much are commercial customers willing to pay for DSM or invest in energy efficiency upgrades? What are the competing activities by market segment?
- What is needed to get customers to participate in DSM/EE programs in terms of incentives, marketing, partnering and implementation approaches?
- What does the decision-making power in each market look like? Who owns/pays the bill and has decision-making authority in each segment and subsegment?
- What are the opportunities in midstream and upstream design models for residential and nonresidential segments respectively in DESC's territory? What incentive offering (midstream or upstream) would most influence the customer decision-making process, provide the most education to customers directly?
- What are the opportunities and barriers to managing winter peaking demand response among DESC nonresidential customers?
- How can DESC best address customer energy education needs in DSM/EE programs?

In addition, the Study Team explored the following research questions as part of a deep dive on small business and community-serving institutions (CSIs):-

- What services, either through DESC or others, are available to small businesses and CSIs?
- Which segments or regions have been historically underserved by DESC programs?
- What energy-related issues and needs do small businesses and CSIs have? Which of these issues could DESC potentially address?
- What barriers to energy management generally and participation in DESC programs do small businesses and CSIs face?
- What sorts of needs, energy-related or non-energy-related, do small businesses and CSIs have that must be addressed before or in tandem with EE upgrades?

- What possible marketing, education and outreach strategies do community leaders suggest would encourage EE/DSM participation among small businesses and CSIs?
- Given the needs of and barriers facing these customers, are there other strategies or partnerships DESC should consider?
- What other sources of funding for small businesses could be leveraged by DESC EE programs?

## 1.2 Target Population

This study focused on DESC's electric customer base (electric-only or combo customers) including commercial, industrial, and opt-out customers. The Study Team explored the characteristics of these customers, their usage, their historical participation in programs, their electricity-using equipment in existing buildings, electric vehicle (EV) penetration, winter peaking demand response opportunities among customers, the opportunities for midstream and upstream program design strategies and a deep-dive on small business customers.

## 1.3 Data Collection Methods and Sources

The Study Team used a variety of data sources to complete this study, including primary data collection, secondary data review and complex modeling. Primary data collection included three data collection activities: (1) a phone survey with commercial customers, (2) on-site visits where DESC staff collected data in commercial buildings, and (3) in-depth interviews with small business community leaders, distributors, opt-out customers and key DESC staff. In addition, the Study Team reviewed secondary data including Commercial Buildings Energy Consumption Survey (CBECS) data and conducted literature reviews for midstream/upstream and winter peak demand programs.

Table 1. Primary Data Collection Summary

| Primary Data collection   | Timeline             | Completed Interviews |
|---------------------------|----------------------|----------------------|
| Commercial phone survey   | January – April 2022 | 275                  |
| Commercial on-site visits | March – April 2022   | 77                   |
| In-depth interviews       | January – March 2022 | 39                   |

The commercial phone survey measured respondents' willingness to adopt energy-efficient technologies and participate in demand response (DR) programs, barriers to participation, energy perceptions, intent, concern, energy priorities, and additional building and firm characteristics. On-site visits measured the penetration, saturation, and equipment characteristics of heating, cooling, water heating, cooking, refrigeration, commercial appliances, electronics, thermostats, building envelope, and other high energy using equipment. Data gathered through in-depth interviews include community leader perspectives on interventions and support for small business customers, opt-out customer feedback on reasons for opting out and barriers to opt back in, and distributor and manufacturer perspectives on potential midstream and upstream program design.

## 1.4 Key Findings & Recommendations

### 1.4.1 Potential Model Inputs

#### Penetration, Saturation and Equipment Characteristics

The Study Team collected commercial penetration, saturation and equipment characteristics by equipment categories and building envelope measures as key inputs to the potential model. This report includes detailed

penetration results and building characteristics by small and medium/large business categories. Additional details for all penetration, saturation and equipment characteristics are provided in Appendix A.

The team was able to determine several key characteristics and equipment types:

- The average commercial facility was built in 1974. Small business facilities are older than medium/large business facilities (1973 vs. 1994). On average, commercial facilities have one floor. 84% of facilities had parking.
- Overall, 64% of commercial customers indicated that they owned or partially owned their facility, 34% indicated they leased/rented their facility, and the remaining 2% indicated they only managed their facility and did not lease or own it.
- Facilities are occupied for longer on weekdays than weekends (9.87 hours vs. 6.64 hours) and have 13 employees on average.
- About half of commercial customers rely on air source heat pumps (ASHPs) (47%) for space heating needs; and almost three-quarters (73%) have electric space heat.
- 83% of commercial customers have central cooling.
- 68% of commercial customers have electric water heating. The most common water heater type is a storage tank (59%), while 10% of commercial customers have a tankless and 3% have a heat pump water heater.
- 9% of commercial customers currently have a smart thermostat at their facility.

These baseline results serve as an important input to the 2022 DESC potential study; however, they also identify specific market needs for DESC customers. Similar to the residential sector, smart thermostats and heat pump water heaters provide areas of opportunity for future DSM EE and DR opportunities. Smart thermostats provide an opportunity for energy savings and better management of heating and cooling load. This technology is a precursor for future demand response direct load control (DLC) programs.

### Electric Vehicle and Commercial Fleet Penetration and Electric Vehicle Interest

The Study Team found that less than one percent of customers included in the phone surveys and on-site visits have commercial EV and associated infrastructure. Given the small sample size subject to primary data collection, the Study Team instead relied on secondary data sources to present EV penetration and existing charging infrastructure in DESC territory. As of May 2021, there are 414 public EV charging stations in South Carolina and 929 EV charging ports (90 of which are private and therefore likely residential).<sup>1</sup> Between 2016 and 2018, South Carolina vehicle registrations for EVs and PHEVs was 4,275 and 1,945 EVs and 5,208, respectively. This represents less than half of a percent of all vehicle registrations in the state during this time period.<sup>2</sup>

As part of this market study, the team explored customer interest and energy-saving potential as a result of increased use of EVs. A foundational step in this research involved understanding the existing infrastructure related to EVs for commercial customers. Overall, 16% of respondents indicated their business had fleet vehicles, of businesses that had fleet vehicles 82% had fleet vehicle parking. Of businesses with fleet vehicles, only 16% indicated they were interested in purchasing EVs at all in the next two years (6% were “moderately likely,” 9% were “somewhat likely,” and 1% were “extremely likely”).

<sup>1</sup> U.S. Department of Energy, Alternative Fuels Data Center: <https://afdc.energy.gov/states/sc>. Accessed May 4, 2022

<sup>2</sup> U.S. Department of Energy, Alternative Fuels Data Center: South Carolina Vehicle Data: <https://energy.sc.gov/node/3084>. Accessed May 4, 2022

## 1.4.2 Customer Characterization

As of Fall 2021, DESC had 105,779 electric commercial customer premises and 790 industrial customer premises. This customer database was then characterized through multiple complex analyses: (1) analysis of cleaned and annualized consumption to identify high and low users in general and by square foot, (2) economic analysis of DESC's customer base, and (3) program participation analysis to identify participation among customer premises between PY1 and PY11. Customer premises were classified by DESC rate class for the purposes of primary data collection and analysis.

### Commercial Usage

The Study Team investigated electricity usage and created three usage categories (low, medium, and high usage) for each business premise size category, as well as usage by square foot where available (full details provided in Section 4). Low usage levels among small business customer premises are much lower than relative low usage among medium or large business premises. The Study Team calculated annualized usage or KWH per square foot (KWH/SQFT) for every commercial customer premise where usage and square footage was available. Overall, average annualized usage per square foot was 18.5 KWH/SQFT. As expected, usage per square foot increased significantly between small (12.9 KWH/SQFT), medium (76.2 KWH/SQFT), and large commercial customer premises (797.8 KWH/SQFT). Note, the sample size of large business customer premises was 36. Among business segments food service customer premises use the highest KWH per square foot (53.6 KWH/SQFT). These usage metrics are appended to the commercial customer database and will be useful in targeting high users across business categories and segments.

### Industrial Usage

As of August 2021, DESC has 790 customer premises identified as Industrial. These premises include about half of all opt-out customers (190 of 362). These opt-out customers make up a large portion of industrial usage. The Study Team had sufficient data to calculate mean annualized consumption for approximately 70% of premises identified as industrial in DESC's customer database. The average annualized KWH for industrial premises drops by about half when you consider usage with opt-out customers included (5.6 million KWH) and average usage without including opt-out customers (2.4 million KWH).

### Historical Participation

The Study Team merged available participation data from PY1–PY11 with the customer database and assessed historical participation of DESC's commercial electric customer premises. In total, the team mapped 6,250 customer accounts from the historical participation data to the current commercial customer database. Historical participation is high among medium and large business premises (33% and 49% respectively), especially when you compare that participation to small business customer premises overall (6%). Small business participation was the same (6%) after reviewing only accounts that are currently eligible under the current small business program eligibility requirements as well. Lighting measures have been the focus of the majority of medium and large business participation so far. There are opportunities for participation in DSM program offerings from small, medium, and large commercial premises, especially in these additional end-use categories such as HVAC, refrigeration, and controls. One example of this opportunity is that 41% of medium-sized business premises who have not participated are in the food service segment. Similar to the usage information, these historical participation flags will be included with the nonresidential database for targeting of future DSM program outreach.

## Energy Priorities and Concern

The Study Team examined customers estimated revenue against their current annualized DESC energy bills, as well as asking customers directly about their concern over energy costs and its associated priority when it comes to company spending. On average, commercial customers' annual energy costs make up 2% of their annual revenue. When asked about the impact of energy costs on their annual operating budget, 69% of commercial customers noted that energy costs had a little or moderate impact on their operating budget (37% said "little impact" and 32% said "moderate impact"). This finding is in line with the overall small percentage of revenue that goes to energy operating costs.

Energy costs have a similar impact on small business customers yet have a larger impact on medium and large business customers. Energy costs are a higher percentage of medium and large business customers' revenue (6% for medium/large businesses versus 1% for small businesses) and these larger bills have a greater impact for medium and large businesses as well. The Study Team asked respondents how much they felt energy costs affected their annual operating budget or annual revenue on a scale of 1 "No impact" to 4 "A large impact." All medium and large commercial business respondents indicated that there was some type of impact of energy costs on their annual operating budget (0% indicated "no impact" while 17% of small business customers indicated "no impact"). In addition, the mean score for medium and large business customers was 3.14 compared to a 2.42 for small businesses (on a scale of 1 "No impact" to 4 "A large impact").

For customers who were concerned about affording their energy costs in general, the Study Team asked respondents to compare their concern for their energy costs to their concern for other expenses for which they were responsible. Over half (53%) of medium and large businesses were "more concerned about energy costs than other expenditures" compared to 36% of small business customers who were "more concerned about energy costs than other expenditures."

### 1.4.3 Midstream and Upstream Programs

Midstream programs, targeting distributors instead of customers or contractors, may have the potential to achieve greater savings than traditional downstream programs because they intervene higher up in the supply chain, which generally enables these programs to reach a larger share of the market than traditional programs. Based on a literature review and interviews with distributors in DESC service territory, the Study Team identified an opportunity for DESC to capture additional energy savings through a midstream program design. Based on the literature review, lighting and HVAC equipment have been the primary commercial categories for midstream products. Given current market conditions, midstream lighting models are focusing on control-related technologies and midstream HVAC models are focusing on heat pump technologies, variable refrigerant flow (VRF) and variable refrigerant volume (VRV), electronically commutated motors (ECMs), advanced thermostats, fans, pumps, compressors, and variable frequency drives (VFDs). The team interviewed nine distributors looking to understand awareness of midstream programs, involvement in this type of program delivery model, and receptivity to participating in a DESC-sponsored midstream program. Interviewees included both lighting and HVAC equipment distributors serving a combination of residential and nonresidential buildings. A key takeaway from these interviews is that HVAC distributors were aware of midstream programs and thought favorably of them in general. While HVAC distributors did identify a number of important considerations for a program, they responded positively to the possibility of midstream program design. Lighting distributors had more mixed opinions but agreed that lighting controls were an area with more growth and interest.



#### 1.4.4 Winter Peak Demand Response

For nonresidential customers as the workday begins and lighting, HVAC and other commercial and industrial (C&I) systems go live, demand for electricity rapidly increases. With these load shape characteristics in mind, utilities can begin to pinpoint the best ways to address peak periods of demand on the grid. DESC's commitment to installing advanced metering infrastructure (AMI) for all meters in its service territory over the next few years will greatly widen the scope of DR capabilities.<sup>3</sup> The Study Team identified four types of DR interventions that can be leveraged to manage winter peak demand as a part of the literature review: (1) DLC technologies; (2) weatherization strategies to improve the building envelope and bolster savings; (3) automated DR; and (4) rate and pricing programs such as time-of-use rates (TOU), real-time pricing (RTP) and critical peak pricing (CPP). These DR interventions encourage customers to consume energy during cheaper time periods by increasing the price per kWh of electricity during times of peak or critical peak demand.

The Study Team gathered information from commercial customers on their interest in DR programs such as DLC programs and TOU programs. Barriers to DLC participation included concerns about allowing outside control of their thermostat (mean of 3.22 on a scale of 1 "Not a barrier" to 5 "Extreme barrier"), negative impacts on facility operations (mean of 3.48) and data security (mean of 2.76). Barriers to TOU participation included the costs of electricity during peak periods (mean of 3.06 on a scale of 1 "Not a barrier" to 5 "Extreme barrier"), need to use electricity during peak hours (mean of 3.17) and potential negative impacts on facility operations (mean of 2.89).

#### 1.4.5 Small Business Program Design and Engagement

The vast majority of DESC business customer premises (approximately 93.8K out of 96.4K) are small business premises as defined by the current rate code in which the customer is enrolled. Offices are the single largest segment (approximately 20K customer premises), followed by the combined segment of Education, Assembly, and Hospitality (approximately 10K customer premises). It should be noted that the currently designed DSM Small Business Energy Solutions Program is not defined by rate code alone and includes additional eligibility requirements which includes annual electric usage and number of accounts per customer ID.

On average, small business premises have much lower energy usage per square foot (12.9 KWH/sq. ft.) compared to medium (76.2 KWH/sq. ft.) or large (797.8 KWH/sq. ft.) business premises; and they spend a smaller percentage of their annual revenue on energy costs (1%) compared to medium/large business premises (6%). Food service is a relatively small segment (4K customer premises). However, food service may be a particularly high-need segment. Nearly half (44%) of small business premises in this segment are high energy users; a much greater proportion compared to any other small business premise segment (12% to 27%). Food service also has the highest average usage per square foot (53.6 KWH/sq. ft.); more than double any other small business premise segment.

Small businesses consider energy bills to be a mid-tier priority, rating energy costs as a 2.7 out of 4, on average (where 4 is a "high priority"). Over half (59%) indicated they were "Not particularly concerned" about affording their energy costs. Among those with some concern, about two-thirds (64%) said they had the same or less concern about energy bills compared to other expenses. Among small businesses who had greater concerns or priorities, respondents typically mentioned higher priorities related to their employees, customers/clientele, or goods and services; and employee pay/compensation (27%) was the most commonly reported higher priority. A notable minority of small businesses mentioned critical repairs (16%) or cosmetics upgrades (13%) as higher priorities; and these may be related to the building shell or energy-using equipment.

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<sup>3</sup> Dominion Energy South Carolina.



Small businesses had several notable differences compared to medium/large businesses in terms of energy-using equipment. Small businesses have greater opportunity for lighting upgrades. They are more likely to have linear fluorescent lighting (70% vs. 43%) and less likely to have linear LEDs (33% vs. 76%). They are less likely to have LEDs of any other kind (screw-in, exit signs, etc.). Many small businesses do not have lighting controls. They are also more likely to have significant opportunity for electric space and water heating upgrades. They are more likely to have electric primary heating (70% vs. 37%), and more likely to have electric water heating (68% vs 42%). Wi-Fi enabled thermostat (9%) and heat pump water heater (2%) penetration is low in this segment (and all businesses in general). Small businesses are much less likely to have refrigeration equipment of any kind (13% vs. 72%) or commercial cooking equipment such as ovens (12% vs. 75%).

A small proportion of small business premises based on the rate code analysis have participated in a DESC program (6%), especially when compared to medium and large business premises (33% and 49%, respectively). Non-participating small business premises were more likely to be in the other (60%), office (22%), or education, assembly, and hospitality (10%) segments; compared to the retail (5%) and food service (3%). The other and education, assembly, and hospitality segments contain many types of CSIs, like municipalities, churches, and schools, which suggests that CSIs may be relatively more underserved compared to other small businesses. Awareness is perhaps the biggest barrier to participation. Less than half (40%) of the small business survey respondents were aware of DESC's programs. Several community leaders emphasized this point, commenting that many small businesses would not know where to go if they needed help reducing their energy bill.

DESC staff noted that they have a large pipeline of participants; however, it has been difficult to serve them rapidly based on the number of installation staff available. Small businesses are more likely (35%) to rent or lease their building compared to medium/large businesses (7%); which may limit the authority small businesses have to approve comprehensive energy upgrades. Among small business renters, over a third (38%) of respondents said they had no decision-making authority over their facilities' energy-using equipment.

Through our review of small business programs, Small Business Direct Install (SBDI) programs with lighting and refrigeration upgrades are the dominant small business program model in the industry (all 10 utilities the team reviewed have it). Half the utilities the team reviewed have added enhanced HVAC and/or weatherization incentives for small businesses. A few others use more innovative models: business online store, virtual commissioning, and business energy reports; the latter two designs leverage advanced metering infrastructure (AMI) data.

This research also revealed a number of additional best practices regarding small business program design:

- Provide a wide set of eligible measure to meet the needs of multiple segments, but design sub-offerings (e.g., kits or special promotions) with specific target segments in mind.
- Use the popularity of free assessments and lighting upgrades as an entry point for deeper savings measures.
- Assign a personal concierge to small businesses to guide them through all available offerings and streamline participation.
- Reduce or eliminate paperwork, where possible.

Regarding engagement with small businesses, this research, the literature reviews, and community leader interviews revealed a number of best practices and suggestions:

- Categorize the markets to identify and tailor marketing, education and outreach (ME&O) efforts to specific types of target small businesses.

- Develop testimonials that highlight the benefits of customers; for example, similar segments, businesses that rent/lease their space, similar types of end-uses.
- Leverage word-of-mouth marketing within networks of non-profits and other types of CSIs.
- Establish community partnerships with local chambers and statewide organizations serving small businesses.

Community leaders reported that small businesses will typically look to their local chambers of commerce for support and connections to financial resources. Outside of local resources, small businesses may also seek assistance from the South Carolina Small Business Development Center (SCSBDC) or the US Small Business Administration (SBA); both offer various types of support including financial resources such as loans and grants. President Biden's Bipartisan Infrastructure Investment and Jobs Act presents another potential opportunity for additional funding in the near future. DESC would likely not qualify as a recipient for these funds. As such, DESC would need to establish partnerships with community organizations that can qualify (e.g., chambers of commerce, municipal governments, or other non-profits) to leverage this funding. Detailed results regarding small business program design and specific partnership opportunities in Charleston, Aiken, and Saluda are found in Section 10.5.

## 2. Study Overview

The Market Characterization study objectives included several inputs into DESC's 2022 DSM Potential Study. This market assessment was geared toward providing potential model inputs that are well-grounded in DESC's customer base while also characterizing DESC's entire market in terms of energy efficiency (EE) opportunities and barriers.

The Market Characterization report addresses the following research questions:

- Who has participated in programs to date and who has not? What are the characteristics associated with participants vs. nonparticipants?
- Among nonparticipants to date, what are the size, annual energy usage, building, household/business, segment and geographic characteristics?
- How important is EE in decision-making for customers in light of all other priorities?
- How important is the utility bill in the customer's hierarchy of basic needs? For commercial customers, the utility bill is in relation to business operational needs including revenue, operating costs and profit.
- How much are commercial customers willing to pay for DSM or invest in energy efficiency upgrades? What are the competing activities by market segment?
- What is needed to get customers to participate in DSM/EE programs in terms of incentives, marketing, partnering and implementation approaches?
- What does the decision-making power in each market look like? Who owns/pays the bill and has decision-making authority in each segment and subsegment?
- What are the opportunities in midstream and upstream design models for residential and nonresidential segments respectively in DESC's territory? What incentive offering (midstream or upstream) would most influence the customer decision-making process, provide the most education to customers directly?
- What are the opportunities and barriers to managing winter peaking demand response among DESC nonresidential customers?
- How can DESC best address customer energy education needs in DSM/EE programs?

In addition, the Study Team explored the following research questions as part of a deep dive on small business and community-serving institutions (CSIs):

- What services, either through DESC or others, are available to small businesses and CSIs?
- Which segments or regions have been historically underserved by DESC programs?
- What energy-related issues and needs do small businesses and CSIs have? Which of these issues could DESC potentially address?
- What barriers to energy management generally and participation in DESC programs do small businesses and CSIs face?
- What sorts of needs, energy-related or non-energy-related, do small businesses and CSIs have that must be addressed before or in tandem with EE upgrades?
- What possible marketing, education and outreach strategies do community leaders suggest would encourage EE/DSM participation among small businesses and CSIs?
- Given the needs of and barriers facing these customers, are there other strategies or partnerships DESC should consider?
- What other sources of funding for small businesses could be leveraged by DESC EE programs?

### 3. Methods

This study focused on DESC's nonresidential electric customer base (electric only or combo customers) and their electricity-using equipment. For non-commercial customers, including industrial opt-outs, the Study Team relied on existing market data sources and depth interviews with a subset of opt-out customers. Primary data collection focused on the commercial population, namely all commercial premises located in DESC service territory, with the exception of non-retrofitable business premises, such as a billboards or individual streetlights.

The commercial baseline data was collected through a customer phone survey and on-site visits. In total, the team completed 275 phone surveys and 77 on-site visits.

#### 3.1 Primary Data Collection

##### 3.1.1 Commercial Population

The Study Team stratified DESC's commercial electric customer premises into three primary size categories based on rate code designations, corresponding with premise-level electric demand (small, medium, and large). Within each primary size category, premises were further classified within the following five commercial segments: retail, office, food service, education, assembly and hospitality, and other. The other segment includes business activities such as health services, hospitals, repair shops, industrial facilities, warehouses, and construction. Customers with unknown or missing segments are also included within the other segment. It should be noted that current nonresidential program design and eligibility requirements do not align with the rate code designation and other classifications completed by Opinion Dynamics necessary for this analysis.

The sampling unit for all primary data collection was the **business/commercial premise**, which is defined as a unique commercial customer at a unique location. The study-eligible population of commercial premises in DESC's service territory was developed using two steps:

- First, accounts with the same (or similar) names and addresses were identified and consolidation, using text matching algorithms and geocoding.
- Second, accounts out of scope for the primary data collection portion of this study (e.g., communication towers, cable boxes, municipal/street lighting, opt-out customers,<sup>4</sup> or residential premises) were excluded. Excluded accounts represented 1.74% of all commercial accounts.

The Study Team then segmented the population into the survey strata, (i.e., commercial segment and usage category) as follows:

- **Commercial segment** assignments were primarily driven by the four-digit standard industry classification (SIC) code provided in the DESC customer data (available for 11.62% of commercial premises). Where SIC codes were missing or inconclusive, a word-association algorithm was used to assign each commercial premise a predicted probability of belonging to each segment, based on the known segments of other commercial premises. In cases where this probability reached a critical threshold, the Study Team assigned a likely initial segment to the commercial premise (55.28% of

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<sup>4</sup> As of the close of the last program year, there were 378 electric customers who have elected to opt-out of DESC's energy efficiency programs

business-premises). Overall, 65.81% of commercial premises received a segment assignment, with the remaining 10.45% unknown.

- **Business size** was based upon the rate associated with a unique premise ID which identified each commercial premise as either small, medium, or large. The rate codes corresponding to each size are as follows:
  - **Small:** 09D, 022, 012, 009, 9NE, 003, 014, 016, 011, 013, N22, N12, N14 and N16
  - **Medium:** 21A, 021, 020, N20 and 020T
  - **Large:** 023, 023L, 023U, 024, 027, 065 and 066

Table 2 summarizes the commercial population after the above steps

Table 2. DESC Commercial Premises by Segment and Size

| Segment                           | Small         | Medium       | Large      | Total         |
|-----------------------------------|---------------|--------------|------------|---------------|
| Other                             | 54,981        | 534          | 71         | 55,586        |
| Office                            | 20,242        | 374          | 66         | 20,682        |
| Education, assembly & hospitality | 10,075        | 274          | 40         | 10,389        |
| Retail                            | 5,147         | 333          | 25         | 5,505         |
| Food service                      | 3,338         | 925          | 1          | 4,264         |
| <b>Total</b>                      | <b>93,783</b> | <b>2,440</b> | <b>203</b> | <b>96,426</b> |

One key piece of information the team collected in the commercial phone survey was confirmation of the commercial segment by the business customer. At the beginning of the survey, respondents with a segment assignment were asked to confirm their initial segment assignments or provide a revised segment, while survey respondents without a segment assignment were asked to report their commercial segment. Once the survey was completed, the Study Team compared initial segments to self-reported segments and developed population reclassification factors to correct for likely misclassification in the original population. These reclassification factors were used to create survey and on-site visit weights.

Table 3 below provides the summary of the final (adjusted) commercial premise counts, by commercial segment and size.

Table 3. DESC Commercial Customers by Segment and Size

| Segment                           | Small  | Medium/Large | Total  |
|-----------------------------------|--------|--------------|--------|
| Other                             | 43,985 | 569          | 30,572 |
| Office                            | 24,290 | 352          | 28,541 |
| Education, assembly & hospitality | 8,060  | 377          | 10,077 |
| Retail                            | 6,176  | 286          | 17,781 |
| Food service                      | 4,006  | 741          | 5,884  |

*Note:* Population adjustment factors combine medium and large business customers due to insufficient survey completes across segments for both the medium and large category. Totals do not sum to cleaned population total due to limiting adjustment factors to the pool of verified commercial customers (i.e., those with at least nine months of consumption data)

The next sections give a brief overview of the data collection instruments, the sample design and methodology of on-site visits and the phone survey.

## Phone Survey

The phone survey targeted all commercial customers summarized in Table 3 and collected the following information:

- Awareness of EE and demand response programs, EE technologies, and DESC's current energy efficiency programs
- Willingness to adopt EE retrofit technologies and participate in DR programs, as well as barriers to participation
- Energy perceptions, intent and concerns
- Energy costs and economic priorities
- Penetration of major end uses
- EV penetration, charging capabilities, and interest in EV fleets
- Firmographic information and additional building characteristics

Roughly 29,000 commercial customers were called directly, up to nine times, to participate in the survey. The Study Team also sent email notifications to 17,992 customers, which included an inbound telephone number to call and complete the survey with a live interviewer. To encourage survey completion among medium and large business customers, all respondents who completed the survey received a \$50 check mailed to their preferred address.

The Study Team conducted a census of all medium and large business customers with valid contact information and used a stratified simple random sample of 7,517 small business customers initially to accommodate 400 commercial phone survey completes. This sampling strategy assumed a response rate of 10%–15% and sought to yield statistically valid data for the three commercial premise sizes (small, medium, and large) with at least 250 completes among small commercial premises, 100 among medium and 50 among large business customers. Faced with lower-than-expected response and cooperation rates, the Study Team added 5,999 and 14,446 additional small commercial customers to the survey sample approximately 3 weeks and 5 weeks, respectively, into fielding after exhausting the initial sample of small business customers.

Overall, 275 commercial customers completed the survey, with a response rate of 1.2%. The team exceeded the survey target for small commercial customers. Table 4 summarizes survey targets and survey completes, by segment. Soft quota groups were set up and monitored throughout the data collection process to ensure data collected closely followed the characteristics of DESC's customer base. Data weighting was used in analysis, where needed, to ensure segments would not be over-represented in results.

Table 4. Phone Survey Sampling Strategy and Completes

|                                   | Sample Frame | Survey Targets | Survey Completes |
|-----------------------------------|--------------|----------------|------------------|
| Overall                           | 28,958       | 400            | 275              |
| <b>Size</b>                       |              |                |                  |
| Small                             | 27,962       | 250            | 251              |
| Medium                            | 894          | 100            | 21               |
| Large                             | 102          | 50             | 3                |
| <b>Segment</b>                    |              |                |                  |
| Other                             | 16,795       | N/A            | 77               |
| Retail                            | 1,788        | N/A            | 56               |
| Office                            | 5,870        | N/A            | 91               |
| Food service                      | 1,388        | N/A            | 16               |
| Education, assembly & hospitality | 3,117        | N/A            | 35               |

Note: Segments for survey completes based on final commercial segment assigned via survey self-report. Given the large proportion of respondents with unknown or other segments in the sampling frame, the study team elected to not apply specific targets by commercial segment

## On-Site Visits

Commercial customers were recruited to participate in an on-site visit as part of the phone survey. Customers who completed an on-site visit received an additional \$75 incentive. The on-site visits focused on the collection of the following information:

- Detailed information on building characteristics and commercial premise type/ownership structure
- Premise occupancy patterns and behaviors (e.g., hours of operation, conditioned space hours of use, control strategy, etc.)
- Penetration, saturation, and characteristics of key energy-using equipment, including:
  - Heating, cooling, and water heating equipment (and fuel type)
  - Building envelope (insulation)
  - Refrigeration
  - Commercial kitchen and food service equipment (and fuel type)
  - EVs and EV Charging Capabilities
  - Emergency management system (EMS) controls
  - Motors, fans and pumps
  - Compressed air
  - Data center and computing equipment (servers, etc.)
  - Use of renewable energy

The target number of completed on-site visits was 100. The Study Team recruited on-site visit participants during the phone survey, aiming for at least 60 completes among small commercial premises, 30 among medium and 10 among large (Table 5). Once customers were recruited through the phone survey, the Study



## Methods

Team scheduled and conducted the on-site visit. To encourage participation, the team offered customers a \$75 gift card for their participation in the study.

Overall, 115 commercial customers were recruited to complete an on-site visit and 77 were scheduled and completed, with an on-site response rate of 67%. The team did not reach the original on-site completion targets, due to the reduced number of phone survey completes, which limited the number of potential recruits. Table 5 summarizes survey targets and completes, by segment.

Table 5. On-Site Sampling Strategy and Completes

|                                   | Sample Frame | Target Completes | Recruits | Final Completes |
|-----------------------------------|--------------|------------------|----------|-----------------|
| Overall                           | 28,958       | 100              | 115      | 77              |
| <b>Size</b>                       |              |                  |          |                 |
| Small                             | 27,962       | 60               | 100      | 69              |
| Medium                            | 894          | 30               | 13       | 7               |
| Large                             | 102          | 10               | 2        | 1               |
| <b>Segment</b>                    |              |                  |          |                 |
| Other                             | 16,795       | N/A              | 29       | 20              |
| Retail                            | 1,788        | N/A              | 25       | 20              |
| Office                            | 5,870        | N/A              | 35       | 20              |
| Food service                      | 1,388        | N/A              | 10       | 5               |
| Education, assembly & hospitality | 3,117        | N/A              | 16       | 12              |

Note: Segments for survey completes based on final commercial segment assigned via survey self-report. Given the large proportion of respondents with unknown or other segments in the sampling frame, the study team elected to not apply specific targets by commercial segment

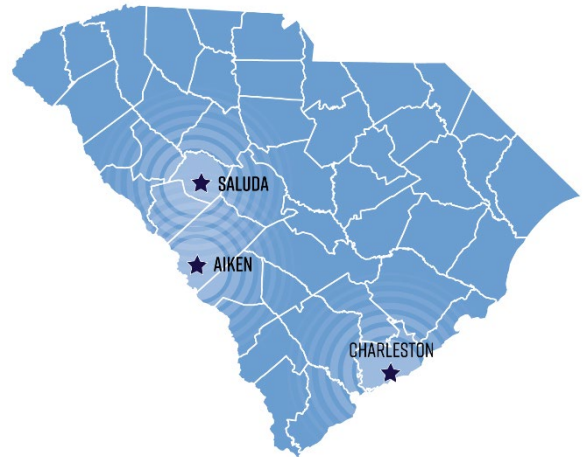
### 3.1.2 Opt-Out Customer Interviews

The Study Team conducted primary research with customers who elected to opt out of the EE rate rider. These interviews explored the reasons customers opted out of the DSM rate rider and the barriers to getting these customers to opt back in. The team spoke with eight opt-out customers and two internal DESC employees as part of this research.

### 3.1.3 Community Leader Interviews

The Study Team conducted in-depth interviews with leaders in the three communities DESC staff identified as regions where, historically, low program participation has occurred: Charleston, Aiken and Saluda (see Figure 1). We selected these three communities to represent one large, one medium, and one small community. Charleston was selected for the “large” community because it has historically received less research focus than Columbia (i.e., DESC has a strong understanding of Columbia and tests most new program offerings there first); and Charleston achieves relatively less program participation. Aiken, the “medium-sized” community, is comprised of widespread hamlets, villages, and unincorporated areas, which creates unique outreach challenges (e.g., it is more costly and time-consuming to reach Aiken households and businesses, compared to more densely populated cities or more cohesive small towns). We chose Saluda as the “small” community target because of its rural location and high proportion of Spanish-speaking residents: a demographic that DESC programs have historically had challenges reaching.

Figure 1. Map of Community Leader Interviews



The team spoke with leaders who were knowledgeable about and/or provided public or not-for-profit services within the selected communities. The team began the interviews by discussing the communities overall and what makes the community unique; key socioeconomic challenges; demographics and business community trends; and the availability of CSIs—for example, medical, educational, and social services—in the community. The team then discussed energy-related topics, which included how small businesses and CSIs in the communities think about energy savings; the main barriers they face with improving energy management; and opportunities for DESC to reach and support these organizations through their energy efficiency offerings. For more detail on the topics and questions we discussed with community leaders, please see the in-depth interview guide in Appendix C.

The Study Team identified and recruited community leaders through a “snowball” sampling approach, where we asked interviewees to suggest additional leaders for the team to contact. We ultimately conducted 11 interviews with 19 community leaders (occasionally, there were multiple interviewees present at the interview) from February through March 2022. The team began with group interviews with DESC staff in the Customer Assistance and Economic Development & Local Government departments; all of whom operated within the target communities. We then leveraged their network of contacts to reach non-DESC-affiliated community leaders. We spoke with three chambers of commerce, one in each community, and focused on their experiences serving small businesses. We also spoke with five nonprofit or municipal organizations who do not serve small businesses but could speak to their own experiences as a CSI (e.g., how their organization manages energy costs or prioritizes energy efficiency). Table 6 provides a detailed list of organizations and the number of leaders we interviewed in each community.

Table 6. Community Leader Interview Participants

| Interviewee Organization by Community                        | Interviewee Count |
|--|-------------------|
| <b>Aiken</b>   | <b>6</b>          |
| Dominion Energy  | 2                 |
| Second Baptist Church, SBC Community Development Corporation | 1                 |
| City of Aiken/Clyburn Medical Center                         | 1                 |
| Aiken Chamber of Commerce                                    | 2                 |
| <b>Charleston</b>  | <b>9</b>          |
| Dominion Energy  | 3                 |
| Charleston Promise Neighborhood                              | 1                 |
| East Cooper Community Outreach                               | 4                 |
| Charleston Metro Chamber of Commerce                         | 1                 |
| <b>Saluda</b>  | <b>4</b>          |
| Dominion Energy  | 2                 |
| GLEAMNS Human Resources Commission, Inc <sup>a</sup>         | 1                 |
| Town of Saluda/Saluda County Chamber of Commerce             | 1                 |
| <b>Grand Total</b>   | <b>19</b>         |

<sup>a</sup> GLEAMNS is an initialism of the counties the agency serves: Greenwood, Laurens, Edgefield, Abbeville, McCormick, Newberry and Saluda.

In addition, the team also conducted an exploratory interview with the South Carolina Small Business Chamber of Commerce to get a statewide perspective on the services and support available to small businesses, along with a sense of particular challenges they may face and opportunities to help resolve these issues.

### 3.1.4 Midstream/Upstream Market Actor Interviews

The Study Team conducted interviews with distributors in DESC service territory, looking to understand awareness of midstream programs, involvement in this type of program delivery model, and receptivity to participating in a DESC-sponsored midstream program. Interviewees included both lighting and HVAC equipment distributors serving a combination of residential and nonresidential buildings. The team completed nine interviews representing eight distributors.

The team also facilitated two market actor workshops in March of 2019 at Dominion's offices in Cayce and Charleston, respectively. The first workshop was held with residential and small business HVAC and plumbing contractors and the second workshop was held with residential and commercial equipment distributors. In the contractor workshop, this workshop ran similar to a focus group, with a moderator and a set agenda of topics for discussion. Seven contractors attended the first workshop, which included five small business HVAC contractors. All attendees of the contractor workshop serviced the Columbia area, some service Aiken, and one services Charleston. The discussion topics covered by the residential contractor workshop include: Water Heating, HVAC Equipment, Duct Repair & Replacement, Tune-Ups, Small Business Non-Lighting Measures, Midstream Delivery Channel Program Concept, and Miscellaneous Items.

In the distributor workshop, five of the eight recruited equipment distributors attended the second workshop. All attendees are lighting suppliers, one distributes commercial food service equipment, and two also supply HVAC and water heating equipment. The HVAC distributors partner with set manufacturers and have agreements with those specific brands. Most of the lighting distributors can essentially sell any type of lighting

that a customer requests, but one is an exclusive distributor for one specific brand. The discussion topics covered by the equipment distributor workshop include: Awareness of Current Downstream Model and Offered Measures, and Midstream Delivery Channel Program Concept as it relates to Residential HVAC.

## 3.2 Secondary Data Collection

### 3.2.1 Literature Review

The Study Team conducted a literature review of secondary research papers and evaluation, measurement and verification (EM&V) reports to identify best practices in the industry and popular trends among other utilities, targeting many in the southeast region near DESC territory. Through this review, the team closely examined small business programs for approximately 15 utilities across 15 states (See Appendix D for a full list of sources reviewed), ME&O best practices, funding sources and successful approaches to community partnerships. In addition, the team examined midstream and upstream programs, winter peak demand response.

### 3.2.2 CBECS Data

The Study Team reviewed the most recent US Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS) for 2018 where available.<sup>5</sup> 2018 CBECS data is currently available for building characteristics and occupancy patterns. For equipment categories where 2018 CBECS data is not yet available, the team reviewed the most recent 2012 data for the South Atlantic region.<sup>6</sup> These categories include space heating, central cooling and water heating equipment categories.

### 3.2.3 Tax Assessor Data

The team obtained square footage data for all of the counties within DESC territory from CRS Data. CRS Data acquires county level tax assessor data and aggregates this data. The data received had multiple data quality issues that limited the calculation of annualized usage per square foot for a majority of nonresidential customers; this is discussed further in the customer characterization section (Section 4.1).

### 3.2.4 Modeled Revenue Data

For the purposes of the economic analysis of all commercial customers, the Study Team leveraged actual and modeled annual revenue estimates from InfoUSA.

## 3.3 Data Cleaning

### 3.3.1 Phone Survey

The Study Team identified survey respondents who completed all of the survey or at least up through the firmographics section. Other partial completes were excluded from analysis. This resulted in a final survey

<sup>5</sup> US Energy Information Administration, Office of Energy Demand and Integrated Statistics, Form EIA-457A of the 2018 Commercial Building Energy Consumption Survey, Preliminary data release date: March 2022

<sup>6</sup> US Energy Information Administration, Office of Energy Demand and Integrated Statistics, Form EIA-457A of the 2012 Commercial Buildings Energy Consumption Survey, Final release date: May 2018

sample size of 275. Additionally, the team identified nonsensical, unclear, or contradicting answers and recoded these data points to “unknown.”

### 3.3.2 On-Site Visit

The Study Team extensively reviewed the on-site data to ensure its accuracy for all 77 audited commercial premises. The team held an online training session for all Study Team auditors prior to the survey entering the field, which included an overview of the excel-based site audit tool with an engineering representative from the team. In the instances of unclear, contradicting, or missing information, the Study Team worked with the site auditors to remedy these items.

## 3.4 Weighting

The Study Team calculated analysis weights for both survey and on-site data to correct for over- and under-samples related to business category and business segment. The team stratified the survey sample into two primary segments (small, medium and large businesses) and within each primary segment, we further classified the sample within the following five business segments: office, education/assembly/hospitality, retail, food service and other. The Study Team used the estimated population counts based on segment reclassification described previously in Section 3.1.1 and Table 3 to calculate survey weights and on-site visit weights for analysis.

- **Phone survey weights.** The Study Team developed survey weights based on the proportion of survey respondents in each stratum relative to the distribution of DESC’s commercial customer population across the same dimensions.
- **On-site visit weights.** The Study Team developed survey weights based on the proportion of survey respondents in each stratum relative to the distribution of DESC’s commercial customer population across the same dimensions. Both the phone survey weights and on-site weights utilized the same commercial customer population.

## 3.5 Penetration and Saturation Methodology

Penetration and saturation results presented in Section 7 and are based on the data collected in the on-site visits described above. Penetration and saturation concepts are defined as follows:

- **Penetration:** A percentage representing the proportion of customers with one or more unit of a particular piece of equipment. Penetration is calculated by dividing the number of customers with one or more units of a piece of equipment by the total number of customers responding to that question. For example, the ASHP penetration rate for small commercial customer customers is 47%, meaning that 47 out of every 100 small commercial customer premises have an ASHP.
- **Saturation:** A number representing how many units of a particular piece of equipment are present, on average, among all customers. Saturation is calculated by dividing the total number of units of a particular piece of equipment by the total number of customers (including those who do not have the equipment).

## 3.6 Adoption Curve Methodology

The Study Team developed adoption curve estimates for two commercial segments: (1) small commercial business and (2) medium/large commercial business. Commercial adoption curves are based on responses to the phone survey.

### 3.6.1 Measures/Programs Covered by Primary Research

The Study Team developed adoption curves for the energy efficiency end uses and DR programs as shown in Table 7.

Table 7. Commercial Measures/Programs Included in Primary Research

| Measures/Program                                   | Applicability   |
|--|---|
| <b>EE equipment</b>                                |   |
| HVAC<br>Water heating<br>Lighting<br>Refrigeration | Commercial customers who have the end use/measure and have decision-making authority over the end use/measure |
| <b>DR programs</b>                                 |   |
| Custom DR  | Medium/large business customers with at least 100 kW peak demand  |
| Smart thermostat DR                                | Small commercial customers who have a smart thermostat  |
| Time-of-day rates                                  | All commercial customers  |

### Adoption Curve Inputs

Similar to residential adoption curves, commercial adoption curves are based on three types of survey questions: (1) willingness-to-participate (WTP) at different payback periods, (2) barriers to adopting energy-efficient equipment, and (3) awareness of DESC programs. While adoption rates for all commercial end uses/programs rely on these three factors, there are slight differences in how adoption rates are calculated for energy efficiency end uses and for DR programs. These differences are noted below.

#### Willingness-to-Participate

Direct WTP questions are the starting point of end use/program-specific adoption curve calculations. WTP questions focus on potential financial barriers to energy efficiency for major and minor energy-related investments without specifying a particular measure or end use. Separately for major and minor investments, the Study Team asked respondents to rate the likelihood they would replace failed equipment with an energy-efficient model under a range of different payback period assumptions. The range of different payback periods reflects different incentive levels from DESC, which reduce the initial investment by different amounts, holding all else constant. For the Smart Thermostat DR Program, the WTP questions assessed participation at various incentive levels. For the Time-of-Day Rate Program, the WTP questions assessed participation at various discounted off-peak rates.

The scales for the WTP questions are five-point labeled scales. Table 8 shows the response options and the likelihood factor associated with each option. This likelihood factor represents the preliminary adoption score for each survey respondent.

Table 8. Commercial WTP Response Options and Scoring

| Response Option       | Preliminary Adoption Score |
|-----------------------|----------------------------|
| 1 – Not at all likely | 0.00                       |
| 2 – Slightly likely   | 0.25                       |
| 3 – Somewhat likely   | 0.50                       |
| 4 – Moderately likely | 0.75                       |
| 5 – Extremely likely  | 1.00                       |

### Barriers to Adoption

The survey presented respondents with end use/program-specific financial and non-financial barriers to measure adoption/program participation and asked them to rate these barriers on a five-point labeled scale, where 1 meant “Not a barrier,” 2 meant “Slight barrier,” 3 meant “Somewhat of a barrier,” 4 meant “Moderate barrier,” and 5 meant “Extreme barrier.”

For energy efficiency measures, responses to financial and non-financial barrier questions were used to calibrate a respondent’s preliminary adoption score to a particular end use.

For the financial barrier adjustment, the Study Team relied on end use calibration factors that represent the relative financial barrier of an end use compared to the financial barriers across all end uses. For each end use, this factor was calculated as the average (across all respondents) of the highest financial barrier given for the end use divided by the average (across all respondents) of the highest financial barrier given for all end uses. The Study Team developed separate factors for major and minor purchases and by commercial premise size (see Table 9). Survey respondents indicated at what dollar amount they considered an investment to be “major” versus “minor” and each respondents’ reported value was used to define what qualified as a major and minor purchase. The full survey instrument can be found in Appendix C. The financial barriers adjustment recognizes that the financial barriers customers face for a given end use could be higher or lower than average. This calibration is necessary because the preliminary adoption score is not end use specific, and only differentiates between major and minor purchases.

Table 9. Commercial Energy Efficiency Financial Barrier Adjustments

| Usage Category | End Use       | Major Purchases | Minor Purchases |
|----------------|---------------|-----------------|-----------------|
| Small          | HVAC          | 0.9666          | 0.9666          |
|                | Lighting      | 0.9842          | 0.9842          |
|                | Refrigeration | 0.8362          | 0.8362          |
|                | Water heating | 1.1397          | 1.1397          |
| Medium/large   | HVAC          | 0.8637          | 0.8637          |
|                | Lighting      | 1.0111          | 1.0111          |
|                | Refrigeration | 0.9666          | 0.9666          |
|                | Water heating | 1.1063          | 1.1063          |

The non-financial barrier questions were used to develop an additional adjustment factor if the respondent identified at least one significant non-financial barrier (defined as a barrier that was given a response of 4 for a “Moderate barrier” or 5 for an “Extreme barrier”). The non-financial barrier adjustment was made on a stepwise scale because the barrier to choosing the efficient option is lessened as more of the incremental cost is covered (see Table 10).



Table 10. Commercial Energy Efficiency Non-Financial Barrier Adjustments

| Payback Period | Non-Financial Barrier Factor |
|----------------|------------------------------|
| 10 years       | 0.5                          |
| 5 years        | 0.6                          |
| 3 years        | 0.7                          |
| 1 year         | 0.8                          |
| 0 years        | 0.9                          |

Applying financial and non-financial barrier adjustments to the preliminary adoption score results in the adjusted adoption score.

For DR programs, the use of financial and non-financial barrier questions in the adoption algorithm was similar to the residential methodology: The Study Team made adjustments to the preliminary adoption score if (1) the respondent identified at least one significant barrier (defined as a barrier that was given a response of 4 for a “Moderate barrier” or 5 for an “Extreme barrier”) and (2) their likelihood response to the WTP question for adoption without an incentive was greater than a 2 (i.e., more than “slightly likely”). Both financial and non-financial barrier adjustments were made on a stepwise scale because the barrier to choosing the efficient option is lessened as more of the incremental cost is covered.

Table 11 summarizes the financial and non-financial barrier adjustment factors at the different incentive levels covered in the survey, by program. Since these adjustment factors are multiplied by the preliminary adoption score, a lower factor means a greater adjustment. The adjustments for significant financial barriers are greater than for non-financial barriers because there is more of a contradiction between their response and barriers. Applying financial and non-financial barrier adjustments to the preliminary adoption score results in the adjusted adoption score.

Table 11. Commercial DR Barrier Adjustments

| Incentive Level (By Program)  |                             |                          | Adjustment               |                              |
|-------------------------------|-----------------------------|--------------------------|--------------------------|------------------------------|
| Custom DR (Average Incentive) | Time-of-Day Rates           | Smart Thermostat Program | Financial Barrier Factor | Non-Financial Barrier Factor |
| \$0                           | 3% lower than current rates | -                        | 0.2                      | 0.6                          |
| \$25 per KW                   | 4% lower than current rates | \$25                     | 0.4                      | 0.7                          |
| \$50 per KW                   | 6% lower than current rates | \$50                     | 0.6                      | 0.8                          |
| \$100 per KW                  | 8% lower than current rates | \$75                     | 0.8                      | 0.9                          |

### Awareness of DESC Programs

A final barrier to program participation is awareness of DESC’s programs and the available incentives. Once aware of the programs, customers might not have any barriers to participation, but they can only participate if they know the programs and incentives exist. The adjusted adoption score represents the likely action of customers once they know about the program/incentives. To reflect that some customers who might otherwise participate will not be aware of the program, the survey included two types of questions: (1) current awareness of DESC programs/incentives and (2) whether the respondent is a “recent market participant,” defined as having purchased/installed a similar measure in the past three years.

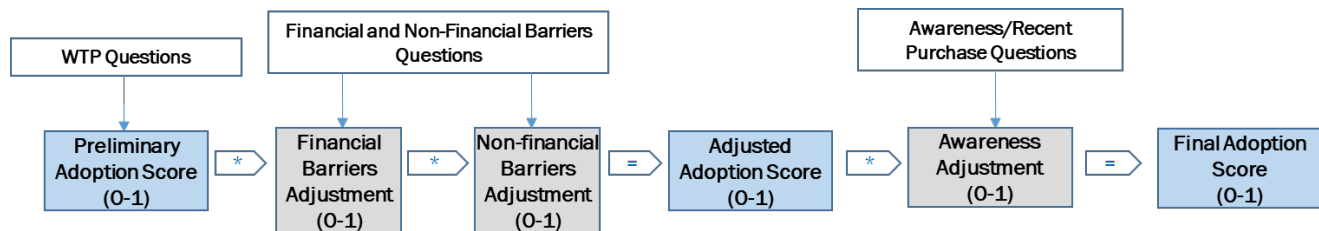
## Methods

The Study Team developed an overall measure-specific awareness adjustment factor for each measure/program. This factor represents the percentage of recent market participants who are aware of DESC programs/incentives. The awareness adjustment is based on recent market participants, rather than all survey respondents, because some customers who are not currently aware of the programs are likely to become aware of them when they are in the market for a certain piece of equipment. For example, somebody may not know about the programs/incentives at the time of the survey, but if their HVAC system breaks, they might find out from their contractor that program incentives are available. As such, the awareness of recent market participants better reflects the likely level of awareness at the time of decision-making around the installation of energy-efficient equipment and program participation.

Application of the awareness adjustment factor to the adjusted adoption score results in the final adoption score.

Equation 1 illustrates how the different types of survey responses are combined to develop commercial adoption curves.

Equation 1. Commercial Adoption Curve Equation



## Aggregation Across Respondents

For each end use/program, the Study Team calculated overall self-reported adoption percentages as the average of all respondents' final adoption score, by usage category and applied the sample weights to adjust for oversampling of some commercial segments.

## 4. Customer Characterization

As of Fall 2021, DESC had 105,779 commercial electric customer premises, 96,426 of which were valid premises that were included in the customer characterization. In addition, DESC industrial customers include 790 premises. The Study Team characterized these premises in the following ways:

- Low, Medium, and High electricity usage (based on overall average annual usage)
- Low, Medium, and High electricity usage (based on average annual usage per square foot)
- Historical participation
- Nonparticipant characteristics
- Economic analysis and energy operating costs
- Customer profiles by commercial segment
- Industrial customer characterization

### 4.1 Usage Categorization

The Study Team characterized the customer database by premises' average annual electricity usage overall and average annual electricity usage per square foot.

#### 4.1.1 Annualized Consumption (KWH)

Table 12 outlines the distribution of overall usage levels, as defined by mean annualized consumption by business category. A low, medium, and high usage level was calculated for each business size category. Low usage among small commercial customer premises is much lower than relative low usage among medium or large commercial customer premises. Consumption at or within one-half of a standard deviation (SD) of the mean is categorized as medium consumption.<sup>7</sup> Anything below or above that is categorized as low and high, respectively, within the bounds described below. In the customer database, the team have flagged these usage categories:

- The medium usage level consists of all premises within +/- 0.5 SD from the mean annualized consumption level. The majority of premises fall into this category by design.
- The low category consists of premises below 0.5 SD, with a lower bound of zero. The Study Team excluded any premise who used less than zero annualized KWH from the categorization, as these premises do not have annualized usage for targeting electric DSM opportunities.
- The high category consists of premises above 0.5 SD of the mean.

<sup>7</sup> The Study Team first excluded outliers to calculate the mean and standard deviation. However, these outliers are added back into the high category since they represent extremely high usage.

Table 12. Distribution of Annualized Usage Levels

| Usage level | Range annualized KWH               | Premises |      |
|-------------|------------------------------------|----------|------|
|             |                                    | n        | %    |
| Small       |                                    |          |      |
| Low         | Less than 1,715 KWH                | 13,351   | 22%  |
| Medium      | 1,715 KWH up to 56,713 KWH         | 37,443   | 63%  |
| High        | Over 56,713 KWH                    | 9,034    | 15%  |
| Mean        | 29,214 KWH                         | 59,828   | 100% |
| Medium      |                                    |          |      |
| Low         | Less than 418,340 KWH              | 524      | 37%  |
| Medium      | 418,340 KWH up to 1,210,651 KWH    | 621      | 44%  |
| High        | Over 1,210,651 KWH                 | 266      | 19%  |
| Mean        | 814,495 KWH                        | 1,411    | 100% |
| Large       |                                    |          |      |
| Low         | Less than 4,540,205 KWH            | 49       | 36%  |
| Medium      | 4,540,206 KWH up to 14,426,294 KWH | 60       | 11%  |
| High        | Over 14,426,294                    | 28       | 20%  |
| Mean        | 9,483,250 KWH                      | 137      | 100% |

Table 13 summarizes the percentage of premises by size and segment category that fall within the low or high energy user levels. Small food service has more high users (44%) than other small business segments. Sample sizes for large business premises get very small when broken out by segment so this data should be used with caution. Medium business premises have a wider range of annualized KWH users and when compared against other medium business premises, more premises fit in the low usage level than in the high usage level (overall 37% vs 19%). Large business premises have insufficient sample to draw conclusions on low and high users by segment.

Table 13. Summary of Average Annual Energy Use by Commercial Premise Size and Segment

| Segment   | Small      |            | Medium     |            | Large      |            |
|---|------------|------------|------------|------------|------------|------------|
|   | Low        | High       | Low        | High       | Low        | High       |
| Other (Small n=32,114, Medium n=296, Large n=49)                            | 22%        | 12%        | 24%        | 25%        | 29%        | 27%        |
| Retail (Small n=3,461, Medium n=209, Large n=18)                            | 11%        | 27%        | 57%        | 13%        | 61%        | 6%         |
| Office (Small n=14,294, Medium n=247, Large n=44)                           | 32%        | 12%        | 25%        | 30%        | 27%        | 23%        |
| Food service (Small n=2,352, Medium n=454, Large n=1)                       | 10%        | 44%        | 51%        | 12%        | 0%         | 0%         |
| Education, assembly & hospitality (Small n=7,507, Medium n=205, Large n=25) | 17%        | 19%        | 20%        | 18%        | 48%        | 16%        |
| <b>Total</b>  | <b>22%</b> | <b>15%</b> | <b>37%</b> | <b>19%</b> | <b>36%</b> | <b>20%</b> |

As previously discussed, DESC's nonresidential customers can opt out of DSM offerings, meaning that they do not pay the rate-rider and are therefore not eligible for energy-efficiency rebates offered through the DSM programs. At the close of the most recent program year, 378 nonresidential accounts, representing approximately 22% of DESC's retail electric load, remained opted-out of DESC's Demand Side Management

programs.<sup>8</sup> The Study Team identified 362 opt-out accounts in the customer database received in August 2021. Among those accounts, 169 were flagged as commercial opt-out customer premises which represents less than 0.2% of all commercial customer premises. Furthermore, only 98 of the 169 commercial opt-outs had valid usage data available. Since opt-outs make up roughly a quarter of all industrial premises (190 of 790) and the majority of their load impact occurs within the industrial segment, the study team limited its comparison of annualized usage with and without opt-outs to the industrial segment, as detailed in Section 4.5.

#### 4.1.2 Annualized Consumption Per Square Foot (KWH/SQFT)

Annualized electricity consumption varies greatly for commercial premises. The variability in usage is not only due to differences by size category or business segment but is also dependent on the square footage of the building premise and end-use equipment. In this section, the team summarizes electricity usage per square foot for commercial premises, providing an additional layer of information for DESC to target commercial customer premises with future DSM programs.

The team obtained square footage data for all of the counties within DESC territory from CRS Data. CRS Data maintains a database of county level tax assessor data for all residential and nonresidential addresses available. This data received; however, had multiple data quality issues, such as:

- Not every address provided by CRS Data had tax assessor square foot data
- The CRS data did not distinguish between square footage of conditioned versus unconditioned space, and instead represents total square footage of a given address, which results in lower average KWH per square foot for some premises.
- The dataset did not include new construction, as there is a one-year lag between construction completion and tax assessment
- COVID-19 impacted the collection of tax assessment data across multiple counties in South Carolina, thus not all square footage reported was up to date
- Data included both residential and commercial addresses within the same file and some addresses appeared to have both residential and commercial square footage within the same physical address.

Given the outlined issues, the team was only able to map square footage data to a subset of commercial premises (19,676 in total). Further, only 56% (n=10,979) premises with square footage data also had valid annualized usage data. These limitations result in smaller sample sizes for KWH/SQFT by business size categories and business segments.

Table 14 summarizes the average building size and usage per square foot for the 10,979 customer premises with valid annualized usage and square footage data. Overall, commercial customer premises have an average of 18.5 KWH per square foot. This average usage measurement (KWH/SQFT) is comparable to the last reported CBECS value for the South Atlantic region 18.3 KWH/SQFT<sup>9</sup>. As expected, usage per square foot increases as business size categories increase; however, the sample size for large business premises is small and should be used with caution.

<sup>8</sup> DESC's Annual Update on Demand Side Management Programs and Petition to Update Rate Rider submitted in January 2022 to the Public Service Commission of South Carolina, Page 22. <https://dms.psc.sc.gov/Web/Dockets/Detail/118088>.

<sup>9</sup> US Energy Information Administration, Office of Energy Demand and Integrated Statistics, Form EIA-457A of the 2012 Commercial Buildings Energy Consumption Survey, Final release date: May 2018

Table 14. Average Building Size and Usage per Square Foot by Business Category

|                          | n      | Average Building Size (SQFT) | Average Annualized Usage per Square Foot (KWH/SQFT) |
|--------------------------|--------|------------------------------|---|
| Overall                  | 10,979 | 12,675                       | 18.5  |
| <b>Business category</b> |        |                              |   |
| Small business           | 10,416 | 11,027                       | 12.9  |
| Medium business          | 527    | 33,765                       | 76.2  |
| Large business           | 36     | 180,734                      | 797.8   |

Table 15 summarizes average building size and annualized usage per square foot by segment. In addition, the team reviewed usage by electric only and combo (electric and natural gas) usage customers. The food service business segment has the highest annualized usage per square foot (53.6 KWH/SQFT) of the business segments reviewed below.

Table 15. Average Building Size and Usage per Square Foot by Segment

|  | Segment          |                |   |                      |                 |
|--|------------------|----------------|---|----------------------|-----------------|
|  | Office (n=2,022) | Retail (n=929) | Education, Assembly & Hospitality (n=1,611) | Food Service (n=777) | Other (n=5,642) |
| Average building size (SQFT)                               | 17,940           | 16,167         | 16,747                                      | 7,605                | 9,747           |
| <b>Average annualized usage per square foot (KWH/SQFT)</b> |                  |                |   |                      |                 |
| Overall  | 14.6             | 19.3           | 21.8  | 53.6                 | 14.0            |
| Electric only  | 13.7             | 12.7           | 16.8  | 41.4                 | 14.1            |
| Combo  | 17.2             | 27.1           | 28.8  | 64.0                 | 13.9            |

## 4.2 Historical Participation

The Study Team merged available participation data from PY1–PY11 with the customer database and assessed historical participation of DESC’s customer premises. In total, the team mapped 6,250 customer accounts from the historical participation data to the current commercial customer database. Table 16 outlines participants versus non-participants by segment and Table 17 details past participants by program and segment. The Study Team appended the customer database with historical participation to indicate whether the customer premise has participated in various program types.

- 6,250 DESC commercial customer premises (6% of total commercial customers) identified as past participants.
- Medium and large business premises were more likely to be identified as past participants than small business premises (33% and 49% vs. 6%)
- Business premises categorized as “Retail” (21%) or “Food service” (15%) were most likely to be identified as a past participant.

Table 16. Historical Participation Counts

|                                   | N      | Participant | Nonparticipant |
|-----------------------------------|--------|-------------|----------------|
| Overall                           | 96,426 | 6%          | 94%            |
| <b>Size</b>                       |        |             |                |
| Small                             | 93,783 | 6%          | 94%            |
| Medium                            | 2,440  | 33%         | 67%            |
| Large                             | 203    | 49%         | 51%            |
| <b>Segment</b>                    |        |             |                |
| Other                             | 55,586 | 4%          | 96%            |
| Retail                            | 5,505  | 21%         | 79%            |
| Office                            | 20,682 | 5%          | 95%            |
| Food service                      | 4,264  | 15%         | 85%            |
| Education, assembly & hospitality | 10,389 | 9%          | 91%            |

Note: Percentages are created from the total number of DESC customers in each segment.

Table 17 presents the percentage of participants by program broken down by business size and segment.

- Overall, the EWfYB and SBES programs both had 3% participation.
- Medium and large business premises had higher participation in the EWfYB program than small businesses (32%/49% vs. 3%).
- Amongst business segments, “Retail”, “Food service” and “Education, assembly & hospitality” had the highest participation for both programs.

Table 17. Historical Participation by Program

|                                   | N      | EWfYB | SBES |
|-----------------------------------|--------|-------|------|
| Overall                           | 96,426 | 3%    | 3%   |
| <b>Size</b>                       |        |       |      |
| Small                             | 93,783 | 3%    | 3%   |
| Medium                            | 2,440  | 32%   | 1%   |
| Large                             | 203    | 49%   | 0%   |
| <b>Segment</b>                    |        |       |      |
| Other                             | 55,586 | 2%    | 3%   |
| Retail                            | 5,505  | 14%   | 8%   |
| Office                            | 20,682 | 3%    | 2%   |
| Food service                      | 4,264  | 9%    | 6%   |
| Education, assembly & hospitality | 10,389 | 6%    | 4%   |

Note: Percentages are created from the total number of DESC customers in each segment. Totals will not sum due to customer participation in both EWfYB and SBES.

Table 18 presents the percentage of participants by the measure types incented broken down by business size and segment.

- Overall, the largest share of historical participation involves lighting rebates (6%)



- Medium and large business premises were more likely to have participated in a HVAC, lighting, or control program than small business premises.

Table 18. Historical Participation by End Use

|                                   | N      | HVAC | Refrigeration | Appliances | Lighting | Controls |
|-----------------------------------|--------|------|---------------|------------|----------|----------|
| Overall                           | 96,426 | <1%  | <1%           | <1%        | 6%       | <1%      |
| <b>Size</b>                       |        |      |               |            |          |          |
| Small                             | 93,783 | <1%  | <1%           | <1%        | 5%       | <1%      |
| Medium                            | 2,440  | 5%   | 3%            | 1%         | 27%      | 4%       |
| Large                             | 203    | 9%   | <1%           | 0%         | 39%      | 19%      |
| <b>Segment</b>                    |        |      |               |            |          |          |
| Other                             | 55,586 | <1%  | <1%           | <1%        | 4%       | <1%      |
| Retail                            | 5,505  | 1%   | 1%            | 0%         | 19%      | 1%       |
| Office                            | 20,682 | <1%  | <1%           | <1%        | 5%       | <1%      |
| Food service                      | 4,264  | 1%   | 4%            | <1%        | 12%      | 1%       |
| Education, assembly & hospitality | 10,389 | <1%  | <1%           | <1%        | 9%       | 1%       |

Note: Percentages are created from the total number of DESC customers in each segment. These percentages are not limited to just SBES and EWfYB.

As previously noted, DESC's current nonresidential program design and eligibility requirements do not align with the rate code-based size designation developed by the Study Team. As such, the Study Team conducted additional historical participation analysis looking at only nonresidential small business eligible premises. Of the 103,503 non-residential accounts with a valid customer ID, 41% were small business eligible, 41% were ineligible, and 19% had indeterminable eligibility due to gaps in data. Overall participation increased by one percentage point to 7% when looking only at small business eligible premises; however, there were no meaningful shifts in participation rates when looking at this subset of non-residential customers independently. Overall SBES participation increased from 3% to 6% when only looking at small business eligible premises and overall EWfYB participation decreased by one percentage point.

#### 4.2.1 Nonparticipant Characteristics

Table 19 summarizes the percentage of nonparticipants (customer premises who have not participated in DESC's EE programs as of the close of the most recent program year, PY11) in each business segment by business size.

- **Small business:** Most small business nonparticipants were in the "Other" business segment (60%), followed by "Office" (22%), and "Education, assembly & hospitality" (10%).
- **Medium business:** The largest portion of medium business nonparticipants were in the "Food service" business segment (41%), followed by "Other" (25%), and "Office" (17%).
- **Large business:** The largest portion of large business nonparticipants were in the "Other" business segment (37%), followed by "Office" (28%) and Retail (18%).

Table 19. Summary of Nonparticipants

| Segment                           | N      | Size  |        |       |
|-----------------------------------|--------|-------|--------|-------|
|                                   |        | Small | Medium | Large |
| Other                             | 53,173 | 60%   | 25%    | 37%   |
| Retail                            | 4,340  | 5%    | 7%     | 18%   |
| Office                            | 19,610 | 22%   | 17%    | 28%   |
| Food service                      | 3,645  | 3%    | 41%    | 0%    |
| Education, assembly & hospitality | 9,408  | 10%   | 10%    | 17%   |

Note: Percentages are created from the total number of nonparticipant DESC customers in each segment.

Table 20 presents the percentage of nonparticipants (customer premises who have not participated in DESC's EE programs as of the close of the most recent program year, PY11) in each energy usage bucket by business size.

- Overall, of nonparticipants, the majority were medium usage businesses (63%) followed by low usage (24%) and high usage (13%).
- Small business: The majority of nonparticipants were medium usage business (63%) followed by low usage (24%) and high usage (13%).
- Medium business: The majority of nonparticipants were medium usage business (46%) followed by low usage (36%) and high usage (18%).
- Large business: A similar percentage of large business nonparticipants were low (46%) and medium usage (48%). A small percentage of large business nonparticipants were high usage (6%).

Table 20. Energy usage summary among non-participating premises (%)

| Usage  | N*     | Size  |        |       |       |
|--------|--------|-------|--------|-------|-------|
|        |        | Small | Medium | Large | Total |
| Low    | 13,651 | 24%   | 36%    | 46%   | 24%   |
| Medium | 35,706 | 63%   | 46%    | 48%   | 63%   |
| High   | 7,475  | 13%   | 18%    | 6%    | 13%   |

Note: Percentages are created from the total number of nonparticipant DESC customers in each segment.

\* 33,344 records that did not have usage data have been exclude from this analysis

Table 21 shows the percentage of nonparticipants within 31 counties within DESC territory by business size.

- Of all nonparticipants, 26% were from Charleston County, 18% were from Richland County and 15% were from Lexington County.

Table 21. Nonparticipants Across Counties

|                   | Small  | Medium | Large | All customer premises |
|-------------------|--------|--------|-------|-----------------------|
| n†                | 88,425 | 1,644  | 103   | 90,172                |
| <b>County*</b>    |        |        |       |                       |
| Aiken County      | 8%     | 7%     | 6%    | 8%                    |
| Barnwell County   | 1%     | 1%     | 0%    | 1%                    |
| Beaufort County   | 8%     | 4%     | 1%    | 8%                    |
| Berkeley County   | 4%     | 3%     | 4%    | 4%                    |
| Charleston County | 26%    | 30%    | 21%   | 26%                   |
| Colleton County   | 2%     | 2%     | 1%    | 2%                    |
| Dorchester County | 7%     | 5%     | 3%    | 7%                    |
| Edgefield County  | 1%     | <1%    | 1%    | 1%                    |
| Hampton County    | 1%     | 1%     | 1%    | 1%                    |
| Jasper County     | 2%     | 1%     | 1%    | 2%                    |
| Lexington County  | 15%    | 18%    | 16%   | 15%                   |
| Orangeburg County | 2%     | 1%     | 0%    | 2%                    |
| Richland County   | 18%    | 25%    | 44%   | 18%                   |
| Saluda County     | 1%     | <1%    | 0%    | 1%                    |

Note: Percentages are created from the total number of nonparticipant DESC customers in each segment.

\* Less than 1% of all non-participants came from the following counties: York, Williamsburg, Union, Spartanburg, Newberry, McCormick, Kershaw, Lancaster, Greenwood, Florence, Fairfield, Clarendon, Chester, Calhoun, Bamberg, Allendale, and Abbeville

† 4 records that did not have county have been excluded from this analysis

### 4.3 Economic Analysis & Energy Operating Costs

The Study Team performed an economic analysis of the commercial customer database by acquiring all estimated annual revenue available for DESC commercial premises and comparing it to annualized energy costs from DESC monthly bill amounts for electric only and combo premises. This estimated revenue along with annualized energy costs provide an opportunity to measure the proportion of company expenditure that goes towards energy operating costs. This measurement provides insights into the impact energy costs have on business priorities across customers.

To calculate the 2020 energy costs of commercial customers, the team requested and received billing data for each customer premise. This billing data included electric and natural gas costs but did not include any alternative fuel costs. The Study Team summed the monthly bill amounts to calculate the annual bill amount for each premise. When the full 12 months was not available, the team attempted to impute from the 2021 data for multiple missing months or if only one month was missing, the team took the average of the month immediately before and after. After these attempts, the team excluded anyone who had less than 11 months. For those who had only 11 months, the team annualized the amount.

To estimate annual revenue for DESC's commercial customers, the team leveraged estimated annual revenue data from InfoUSA. The Study Team could not estimate the energy operating costs as a proportion of revenue for premises whose revenue could not be determined using the InfoUSA data. The team ultimately acquired estimated revenue and annualized 2020 energy costs for 13,363 DESC commercial premises.

Table 22 contains the average 2020 energy costs and energy operating costs as a percentage of revenue for commercial DESC customer premises overall and by business size category.

- Overall, commercial businesses spent 2% of revenue on energy costs.
- Medium/large businesses spent more on energy costs in 2020 (\$145,403 vs. \$9,191) and pay a larger proportion of revenue to energy costs (6% vs. 1%) than small businesses.

Table 22. Average Annual DESC Bill and Energy Costs as a Percentage of Revenue

|                          | n      | Annual DESC Bill | Energy Costs as a Percentage of Revenue |
|--------------------------|--------|------------------|---|
| Overall                  | 13,363 | \$17,672         | 2%                                      |
| <b>Business category</b> |        |                  |   |
| Small business           | 12,531 | \$9,191          | 1%                                      |
| Medium/large business    | 832    | \$145,403        | 6%                                      |

Note: Results based on DESC billing data and Revenue based on InfoUSA estimates.

The Study Team compared results from this economic analysis to commercial phone survey respondents and found that 53 commercial survey respondents had sufficient energy bill information and estimated revenue to compare their energy operating costs to the database as a whole. Table 23 summarizes the annual energy bills of commercial phone survey respondents and their percentage of revenue that goes to energy costs. As the team saw in the overall population, energy costs are a very small percentage of revenue overall; however, energy operating costs are a larger percentage of revenue for medium and large commercial customers.

Table 23. Annual DESC Bill and Energy Costs as a Percentage of Revenue: Surveyed Customers Only

|                          | n* | Annual DESC Bill | Energy Costs as a Percentage of Revenue |
|--------------------------|----|------------------|---|
| Overall                  | 53 | \$10,273         | 1%                                      |
| <b>Business category</b> |    |                  |   |
| Small business           | 49 | \$5,939          | 1%                                      |
| Medium/large business    | 4  | \$244,051        | 10%                                     |

Note: Results based on phone survey data

\*One record excluded due to lack of sufficient data

Looking further at the commercial customer perceptions, attitudes, and priorities reported on in Section 6.3 commercial customers noted that they felt that energy costs had a little or moderate impact on their operating budget. This finding is in line with the overall small percentage of revenue that goes to energy operating costs. Medium and large businesses had a slightly higher concern with the impact of energy costs on their operating budget, and again this reflects the increased percentage of revenue that goes towards these energy costs. Medium and large commercial customers are also more concerned about being able to afford their energy costs in comparison to small businesses. Lastly, commercial customers did indicate in these self-reported priorities that energy costs are slightly more of a concern for them in comparison to other expenses. The Study Team summarizes additional details on these energy attitudes and concerns in Section 6.3.

## 4.4 Customer Profiles by Segment

Table 24 summarizes equipment penetration for major end uses as well as facility characteristics using data collected through the phone surveys and on-site visits. Taken together, The Study Team offers the following key findings,

- Overall, commercial customers consistently have more dedicated space heating and water heating than shared heat.
- Commercial segments consistently have electric heat; however, the Education, Assembly and Hospitality segment more often have electric resistance heat than the other business segments.
- Office, Food Service, and Retail customers rent more often than Education, Assembly and Hospitality or other segments.
- Office and Retail segments are more often have older facilities than Education, Assembly, Food Service, and other segments.

Table 24. Summary of Commercial Customers by Segment

|   | Segment          |  |                           |                  |                 |
|---|------------------|--|---------------------------|------------------|-----------------|
|   | Office<br>(n=91) | Education,<br>Assembly &<br>Hospitality (n=35) | Food<br>Service<br>(n=16) | Retail<br>(n=56) | Other<br>(n=77) |
| <b>Space heating</b>                    |                  |  |                           |                  |                 |
| Has heat                                | 99%              | 97%  | 100%                      | 97%              | 82%             |
| Has dedicated space heating             | 92%              | 100%   | 95%                       | 100%             | 100%            |
| Has shared space heating                | 7%               | <1%  | 5%                        | <1%              | <1%             |
| Primary heating fuel – electricity      | 76%              | 68%  | 66%                       | 69%              | 61%             |
| Primary heating fuel - natural gas      | 22%              | 28%  | 34%                       | 27%              | 10%             |
| Primary heating fuel - fuel oil         | <1%              | <1%  | <1%                       | <1%              | 1%              |
| Primary heating fuel – propane          | 1%               | <1%  | <1%                       | <1%              | 7%              |
| Primary heating fuel – biomass          | <1%              | <1%  | <1%                       | <1%              | 2%              |
| <b>Electric space heating equipment</b> |                  |  |                           |                  |                 |
| Average Age of Space Heating Equipment  | 9.1              | 8.9  | 2.0                       | 9.5              | 13.4            |
| Has electric heat                       | 82%              | 70%  | 72%                       | 71%              | 64%             |
| Furnace                                 | 12%              | 21%  | 16%                       | 2%               | 9%              |
| Heat pump                               | 58%              | 38%  | 36%                       | 45%              | 39%             |
| Electric resistance heaters             | 6%               | 17%  | 12%                       | 8%               | 3%              |
| Electric unit or space heater           | 11%              | <1%  | 8%                        | 16%              | 14%             |
| <b>Space cooling</b>                    |                  |  |                           |                  |                 |
| Has central AC                          | 95%              | 83%  | 95%                       | 86%              | 64%             |
| Average SEER for CAC                    | 14.6             | 13.9   | 17.0                      | 11.3             | 13.7            |
| Average Age of CAC (years)              | 9.1              | 8.9  | 2.0                       | 9.5              | 13.4            |
| Has dedicated AC                        | 89%              | 83%  | 89%                       | 86%              | 64%             |
| Has shared AC                           | 6%               | <1%  | 5%                        | <1%              | <1%             |
| Chiller                                 | 1%               | 3%   | <1%                       | 2%               | 1%              |
| Ductless minisplit                      | 7%               | 2%   | 6%                        | 2%               | 9%              |
| Heat Pump                               | 44%              | 37%  | 60%                       | 44%              | 41%             |
| Packaged system                         | 60%              | 42%  | 48%                       | 41%              | 34%             |
| Split system                            | 35%              | 50%  | 46%                       | 39%              | 28%             |
| Window or wall AC units                 | 5%               | 7%   | <1%                       | 6%               | 4%              |

|  | Segment          |  |                           |                  |                 |
|--|------------------|--|---------------------------|------------------|-----------------|
|  | Office<br>(n=91) | Education,<br>Assembly &<br>Hospitality (n=35) | Food<br>Service<br>(n=16) | Retail<br>(n=56) | Other<br>(n=77) |
| <b>Water heating</b>                           |                  |  |                           |                  |                 |
| Has dedicated water heating                    | 78%              | 82%  | 84%                       | 75%              | 67%             |
| Has shared water heating                       | 7%               | <1%  | <1%                       | 1%               | 4%              |
| Dedicated water heater fuel type - electric    | 77%              | 57%  | 52%                       | 73%              | 60%             |
| Dedicated water heater fuel type - natural gas | 8%               | 25%  | 23%                       | 3%               | 10%             |
| Dedicated water heater fuel type - propane     | <1%              | <1%  | 8%                        | <1%              | 3%              |
| Conventional storage tank water heater         | 66%              | 49%  | 77%                       | 52%              | 57%             |
| Heat pump water heater                         | 1%               | 15%  | 6%                        | 3%               | <1%             |
| Indirect/combination system                    | 9%               | 12%  | <1%                       | 2%               | 4%              |
| Tankless water heater                          | 8%               | 19%  | 7%                        | 18%              | 5%              |
| <b>Thermostats</b>                             |                  |  |                           |                  |                 |
| Smart thermostats                              | 11%              | 9%   | 11%                       | 8%               | 8%              |
| <b>Refrigeration</b>                           |                  |  |                           |                  |                 |
| Has commercial refrigeration                   | 10%              | 23%  | 86%                       | 8%               | 11%             |
| <b>Building/facility characteristics</b>       |                  |  |                           |                  |                 |
| Own or partially own                           | 68%              | 75%  | 53%                       | 43%              | 70%             |
| Lease/rent                                     | 31%              | 11%  | 47%                       | 57%              | 27%             |
| Only manage, neither lease nor own             | <1%              | 14%  | <1%                       | <1%              | 3%              |
| Occupy facility (all)                          | 55%              | 65%  | 55%                       | 61%              | 76%             |
| Occupy facility (partial)                      | 47%              | 24%  | 53%                       | 38%              | 26%             |
| Do not occupy facility (manage only)           | 5%               | 11%  | <1%                       | 6%               | 3%              |
| Built before 1900                              | 7%               | 3%   | 11%                       | 12%              | 3%              |
| Built between 1900 and 1949                    | 16%              | 11%  | 11%                       | 19%              | 11%             |
| Built between 1950 and 1969                    | 21%              | 12%  | 0%                        | 5%               | 11%             |
| Built between 1970 and 1989                    | 26%              | 32%  | 30%                       | 36%              | 24%             |
| Built between 1990 and 2009                    | 24%              | 27%  | 37%                       | 21%              | 35%             |
| Built 2010 and after                           | 6%               | 14%  | 12%                       | 7%               | 16%             |

## 4.5 Industrial Customer Characterization

The Industrial sector was reviewed using secondary data sources and the information provided regarding DESC's Industrial customers from their customer database. As of August 2021, DESC has 790 customer premises identified as Industrial. These premises include about half of all opt-out customers (190 of 362).

The Study Team has sufficient data to calculate mean annualized consumption for approximately 70% of premises identified as industrial in DESC's customer database. As shown in Table 25 and Table 26, average annualized KWH for industrial premises is approximately 5.6 million KWH including opt-out customers and drops to just 2.4 million KWH once opt-outs are excluded.

Table 25. Distribution of Annualized Usage Levels for Industrial Customers

| Usage Level | Range Annualized KWH             | Premises |     |
|-------------|----------------------------------|----------|-----|
|             |                                  | N=557    | %   |
| Low         | Less than 100,000 KWH            | 200      | 36% |
| Medium      | 100,000 KWH up to 10,000,000 KWH | 281      | 50% |
| High        | Over 10,000,000 KWH              | 76       | 14% |
| Mean        | 5,565,868 KWH                    |          |     |

Table 26. Summary of Average Annual Energy Use for Industrial Customers

| Usage Level | Range Annualized KWH             | Opt-Outs Only |               | Opt-Outs Excluded |     |
|-------------|----------------------------------|---------------|---------------|-------------------|-----|
|             |                                  | n             | %             | n                 | %   |
| Low         | Less than 100,000 KWH            | 35            | 23%           | 165               | 41% |
| Medium      | 100,000 KWH up to 10,000,000 KWH | 65            | 42%           | 216               | 53% |
| High        | Over 10,000,000 KWH              | 53            | 35%           | 23                | 6%  |
| Mean        | 14,317,115 KWH                   |               | 2,403,289 KWH |                   |     |



## 5. Opt-Out Interviews

The Study Team conducted research with customers who elected to opt out of the energy efficiency rate rider. DSM and EE programs across the country are funded through a special rate included with the energy bills for energy using customers within a given territory or jurisdiction. In South Carolina, regulators have identified what that rate, or DSM factor (\$/KWH), is based on the customer class; inclusion of these factors are often referred to as a “DSM Rate Rider”.

### 5.1 DSM Program Rates and Opt-Out Criteria

In addition to requiring execution of DSM and EE programs in South Carolina and the recovery of costs for these programs through the DSM Rate Rider, there is an exception to the rate rider created through regulation and formalized within orders approving DSM and EE programs and riders. The regulation requires the ability to allow exclusion from the DSM program rate rider for non-residential accounts /companies that meet specific requirements. Companies that choose to be excluded from the rate rider are referred to having “opted-out” or as “opt-outs.” Table 27 below shows the DSM Rider rates for the DESC non-residential customers as of May 2021.

Table 27. DSM Program Rates (\$/KWH) by Customer Class

| Customer Class         | DSM Factor (\$/KWH) |
|------------------------|---------------------|
| Small general service  | 0.00500             |
| Medium general service | 0.00307             |
| Large general service  | 0.00131             |

Not all firms are able to opt out of the DSM programs/rate rider; definitions are provided to individual programs (i.e., DESC) through the Public Service Commission of South Carolina. Criteria for opting out of the program by nonresidential customers are:

- Accounts must be eligible for Rate 23 or Non-residential accounts must have both (i) annual consumption of 1,000,000 kilowatt-hours or greater in the billing months of the prior calendar year and (ii) 52-59 as the first two digits of the Standard Industrial Classification (SIC) or 44- 45 as the first two digits of the six digit North American Industry Classification System (NAICS).
- A customer who elects to participate in DESC DSM programs for any account(s) on or after December 20, 2019, may not apply to opt out for that account(s) for at least three years from the date that the customer accepts a DSM rebate from DESC. Customers who received a DSM rebate prior to December 20, 2019, may not apply to opt out for that account(s) for at least five years from the date that the customer accepts a DSM rebate.
- An authorized representative of the company must provide DESC notification in writing, using the utility-designated form, that the company has implemented or will implement alternative DSM/EE programs at the company’s expense and does not wish to participate in DESC’s DSM program.

## 5.2 Rate Rider Opt-Out Customers

Data reviewed by the Study Team identified 362 accounts from 109 customers who had opted out from the rate rider for DESC's DSM programs. These accounts were distributed among eight general rates and 20 sub-rates classifications, the counts for each are provided in Table 28.

Table 28. Count of Unique Accounts and Unique Customers by General Rate Code

| General Rate Code | Count Of Unique Accounts | Count Of Unique Customers |
|-------------------|--------------------------|---------------------------|
| 9                 | 175                      | 59                        |
| 20                | 76                       | 20                        |
| 23                | 69                       | 62                        |
| 24                | 25                       | 6                         |
| 27                | 7                        | 6                         |
| 60                | 5                        | 5                         |
| 14                | 4                        | 1                         |
| 16                | 1                        | 1                         |
| <b>Total</b>      | <b>362</b>               | <b>160</b>                |

<sup>a</sup>. While the total number of unique customers is 109, the total number in the table is greater than that due to some customers having multiple accounts with different general rate codes. The team found 33 customers with accounts in two different general rate codes, five customers with three different general rate codes, and one customer with accounts in four separate general rate codes.

## 5.3 Interviews

In this study, the team attempted to identify why customers chose to opt out of the DESC program rate-rider and to identify what would be needed to convince these customers to return, or "opt in" to the program. To do this, the team attempted to contact and interview each of the 109 unique customers about their decision to opt out (Table 29).

Table 29. Summary of Opt-Out Interview Dispositions

| Category                           | Count |
|------------------------------------|-------|
| Total customers (unique companies) | 109   |
| Closed/disconnected                | 9     |
| Available sample                   | 100   |
| Organization w/ no local contact   | 38    |
| Attempted, not complete            | 50    |
| Refused                            | 4     |
| Completes                          | 10    |
| Company completes                  | 1     |
| Company partial completes          | 3     |
| Company DK who to address to       | 4     |
| Internal completes <sup>a</sup>    | 2     |

<sup>a</sup>. Completes includes two DESC completes with client-facing account managers not included in count of total customers or available sample.

The amount of information customers provided varied widely across the ten completed interviews. Three interviews were “full completes” (i.e., interviewers able to ask the full battery of questions). The remaining seven were identified as partial completes since the customers provided short responses that allowed for identification of the central research question (i.e., what would be required to get them to opt back into the program). These seven respondents did not know or did not recall the decision to opt out, reported that their internal decisions were confidential, or that they simply would not pay any business cost that was not required.

Many of the additional interviews that the team attempted but was unable to complete, would likely have similar results. On many interview attempts, those answering the calls struggled to identify where to direct inquiries—many attempted to send us to the correct party, but those attempts did not result in a direct refusal, partial complete, or full complete. Inquiries were often routed with good intentions from one person to another with no definitive resolution. This is a common occurrence in large organizations, which comprise a significant portion of the organizations that are eligible to, and have elected to, opt out of the rate rider. The sentiment from partial completes (affirming that they did not know who the right person was to speak to, not recalling the decision, or stating that nothing could make them come back if not required to do so) was supported by the opinions provided by the three complete interviews.

## 5.4 Interview Findings

One significant finding, and three more nuanced findings were garnered from all interviews. Respondents stated in several different ways, that they will not participate if it is not required of them. Some respondents clearly articulated that they simply do not want to pay the rate rider. For others, there were some secondary reasons why they felt that way. Three nuanced themes arose from interviews:

- Large firms with large energy costs often have internal expertise
- Large firms have little motivation to participate due to poor benefit-cost ratio

- Firms do not think about the decision, regardless of firm size

At their core, energy efficiency programs provide two things: specialized expertise and financial incentives. The themes listed above demonstrate that firms that are allowed to and choose to opt out do not see sufficient benefit in those two items.

### Large Firms Have Internal Expertise

As previously mentioned, opt-outs are generally large organizations, and can often be international. Many of these organizations already have internal teams, policies, and/or systems for identifying efficiency opportunities, as well as making energy, equipment, maintenance and other decisions. For these organizations, the value proposition of a program that provides EE expertise does not resonate. This is a significant reduction in the value proposition of any program and a motivating factor for customers to opt out if they are allowed.

### Large Firms Have Little Motivation to Participate: Poor Benefit-Cost Ratio

Large firms operate on a large scale, and view efficiency programs as, at best, a financing program. The financing terms are that the organization can receive a benefit in exchange for program buy-in and payment of the rate rider. The rate rider serves as payment for a loan with two parameters:

- Incentives are capped (here at \$100,000 per Project Type)
- Participants must stay in the program for at least three years following receipt of any incentives

Organizations allowed to opt out are generally large organizations with substantial energy demands. Any rate rider, even those as seemingly small as those listed in Table 27, will cumulatively sum to more than the incentive cap in a year.<sup>10</sup> Businesses quickly understand that the rate rider costs more than it will provide in incentives, and thus opt out.

It is for this reason that public goods programs, such as EE programs, are generally mandatory and universal—if individual rate payers were not required to participate through a mandatory rate rider many or most would opt out.

### Firms Do Not Think About the Decision, Regardless of Firm Size

Interviews revealed that rate riders are not a focus of attention for businesses. Firms do not think extensively about riders on their energy costs.

For larger firms, there are often established groups and policies providing internal expertise, as previously mentioned. Large firms also often have policies or groups that work to ensure cost-cutting measures, such as opting out of a program, are done—automatically, if possible. There is little to no debate about opting out of any particular jurisdiction's rate rider. It is often corporate policy to opt out when permitted.

Smaller firms may give greater relative thought to opting out, but again stated that if they don't have to pay for something, then then will not do so; smaller firms chose to opt out and then forgot about the decision. For organizations of all sizes, it is not a difficult decision to opt out if they are allowed to do so.

<sup>10</sup> Note, the first DESC program years did not have a cap and C&I customers also opted out in the beginning of DESC programs.

## 5.5 Conclusion

Interviews and attempts to conduct interviews revealed significant and helpful nuance to the question of why organizations opt out of programs and the corresponding rate rider. There is a limited value proposition for some companies, a negative benefit-cost ratio for others, programs are sometimes viewed as expensive and there is limited financing available. For other organizations, they simply do not think about the program or do not know who made the decision to opt out.

Unfortunately, program design cannot address these issues. It is not possible to provide more incentives than the program has in available funding to deliver a positive benefit-cost ratio for all organizations. Additionally, it is unlikely that programs can provide greater expertise to organizations than their own internal teams already offer—teams focused solely on internal processes, equipment, and facilities.

Respondents stated clearly that if they can opt out, they will, and there is not much DESC can do to encourage them to opt in in of their own accord. The customers interviewed indicated if they do not have to pay for something, they will not. Under current regulations, certain select companies are permitted to opt out of the rate rider. Consequently, any changes to significantly reduces the number of organizations opting out of the program must be addressed at the regulatory level.

## 6. Awareness, Concern, and Other Barriers

The remainder of this report will focus on the awareness, attitudes, behaviors, penetration, adoption and intentions of commercial customers who have not opted out of the DSM rate rider. Please note that there may be limitations to the comparisons that can be made between small business and medium/large business customers due to the low sample size of the medium/large category.

### 6.1 Current Program Awareness

The Study Team asked respondents to indicate if they were aware that DESC offers rebates and incentives for business customers to save electricity. Table 30 presents the percentage of respondents aware of DESC offerings by business category.

- Overall, 39% of respondents indicated they were aware of DESC rebates and incentives for business customers.
- Small business customers were more aware of DESC rebates and incentives for business customers (40%) than medium/large business customers (26%).

Table 30. Awareness of DESC Commercial Rebates and Incentives

|                          | n   | Aware of DESC Programs |
|--------------------------|-----|------------------------|
| Overall                  | 275 | 39%                    |
| <b>Business category</b> |     |                        |
| Small business           | 251 | 40%                    |
| Medium/large business    | 24  | 26%                    |

Note: Results based on phone survey data

The team asked respondents the best way to inform their company of energy efficiency opportunities like DESC's Small Business, Lighting, or HVAC Upgrade incentive programs. Table 31 presents the percentage of respondents who indicated each outreach method by business category.

- Overall, 50% of respondents indicated that e-mail was the best way to reach them regarding DESC rebate and incentive programs.
- After e-mail, respondents indicated that the most effective way to reach them regarding DESC program offerings was bill inserts (15%), telephone (13%), flyers/ads/mailings (12%), and contact from a DESC representative/account manager (7%).
- Few respondents indicated that a contractor/trade ally (1%), internet radio (1%), SMS/test messages (1%), or some other method (1%) was the best way to reach them regarding DESC program offerings.

Table 31. Best Outreach Methods to Reach Business Customers Regarding DESC Rebate and Incentive Programs

|  | Overall    | Business Category |                       |
|--|------------|-------------------|-----------------------|
|  |            | Small Business    | Medium/Large Business |
| <b>N</b>   | <b>264</b> | <b>241</b>        | <b>23</b>             |
| E-mail   | 50%        | 48%               | 79%                   |
| Bill inserts   | 15%        | 16%               | 0%                    |
| Telephone  | 13%        | 13%               | 3%                    |
| Flyers/ads/mailings                                      | 12%        | 12%               | 8%                    |
| DESC representative or account manager                   | 7%         | 7%                | 10%                   |
| A contractor or trade allies                             | 1%         | 1%                | 0%                    |
| Internet radio (e.g., Pandora, Spotify, or iHeart radio) | 1%         | 1%                | 0%                    |
| SMS/text messages  | 1%         | 1%                | 0%                    |
| Other  | 1%         | 1%                | 0%                    |

Note: Results based on phone survey data



## 6.2 Decision-Making and Firmographics

### 6.2.1 Firmographics

The Study Team asked respondents how many employees (full- and part-time) worked at their facility. Schools/educational institutes were asked to include the number of students in their count of employees. Table 32 presents the average number of employees at facilities by business category.

- Overall, facilities averaged 13 employees.
- Medium/large business facilities had more employees than small business facilities (126 employees vs. 9 employees).

Table 32. Average Number of Employees

|                          | n   | Average Number of Employees |
|--------------------------|-----|-----------------------------|
| Overall                  | 248 | 13                          |
| <b>Business category</b> |     |                             |
| Small business           | 228 | 9                           |
| Medium/large business    | 20  | 126                         |

Note: Results based on phone survey data

The Study Team asked respondents how many facilities they operated in South Carolina that received electricity from DESC. Table 33 presents the average number of facilities respondents owned, managed or occupied that received electricity from DESC by business category.

- Overall, respondents owned, managed or occupied an average of 16 facilities in South Carolina receiving electricity from DESC.
- Respondents for medium/large business facilities owned, managed or occupied more facilities in South Carolina receiving electricity from DESC than respondents for small business facilities (25 facilities vs. 15 facilities).

Table 33. Number of Facilities Owned, Managed or Occupied Receiving Electricity from DESC

|                          | N   | Average Number of Facilities in South Carolina Receiving Electricity from DESC |
|--------------------------|-----|--|
| Overall                  | 248 | 16   |
| <b>Business category</b> |     |  |
| Small business           | 228 | 15   |
| Medium/large business    | 20  | 25   |

Note: Results based on phone survey data

## 6.2.2 Decision-Making

The team asked respondents if they owned/partially owned, leased/rented, or managed their facility. Table 34 presents the percentage of respondents who indicated each ownership status by business category.

- Overall, 64% of respondents indicated that they owned or partially owned their facility. 34% of respondents indicated they leased/rented their facility, and the remaining 2% indicated they only managed their facility and did not lease or own it.

Table 34. Ownership Status

|                          | n   | Owner or Partial Owner | Lease/Rent | Only Manage, Do Not Lease or Own |
|--------------------------|-----|------------------------|------------|----------------------------------|
| Overall                  | 271 | 64%                    | 34%        | 2%                               |
| <b>Business category</b> |     |                        |            |                                  |
| Small business           | 248 | 63%                    | 35%        | 2%                               |
| Medium/large business    | 23  | 87%                    | 7%         | 6%                               |

Note: Results based on phone survey data and on-site verification

The Study Team asked respondents if their company was responsible for paying the electric and gas bills at their facility. Businesses that indicated they owned or partially owned a facility that they solely/entirely occupied were assumed to be responsible for paying the electric and natural gas bill. Table 35 presents the percentage of respondents who indicated their company was responsible for paying electric and gas bills at their facility.

- Nearly all (99%) of respondents indicated their business was responsible for paying their facility's electric bill. Slightly fewer than three-fourths (73%) of respondents representing facilities that used natural gas indicated that their business was responsible for paying the gas bill.
- More medium/large business respondents were more likely than small business respondents to indicate their business was responsible for paying the gas bill.

Table 35. Responsible for Paying Electric and Gas Bill

|                          | n       | Pay Electric Bill | Pay Gas Bill |
|--------------------------|---------|-------------------|--------------|
| Overall                  | 121-257 | 99%               | 73%          |
| <b>Business category</b> |         |                   |              |
| Small business           | 107-234 | 99%               | 71%          |
| Medium/large business    | 14-23   | 100%              | 99%          |

Note: Results based on phone survey data

In addition to ownership status, the Study Team also asked respondents if anyone at their business/organization had authority to purchase or replace at all, some, or none of the energy-using equipment at their facility. Table 36 presents the percentage of respondents who indicated each level of decision-making authority, broken down by ownership status and business category.

- Overall, owners/partial owners were more likely than renters to have decision-making authority over all energy-using equipment (82% vs. 55%). Renters were more likely than owners/partial owners to have no decision-making authority over energy-using equipment (38% vs. 14%).

Table 36. Decision-Making Authority by Ownership Status

|                          | n   | Owner   |  |  | Renter   |   |   |
|--------------------------|-----|---|--|--|--|---|---|
|                          |     | Decision-Making Authority Over All Energy-Using Equipment (Owner) | Decision-Making Authority Over Some Energy-Using Equipment (Owner) | No Decision-Making Authority Over Energy-Using Equipment (Owner) | Decision-Making Authority Over All Energy-Using Equipment (Renter) | Decision-Making Authority Over Some Energy-Using Equipment (Renter) | No Decision-Making Authority Over Energy-Using Equipment (Renter) |
| Overall                  | 255 | 82%   | 4%   | 13%  | 55%  | 8%  | 38%   |
| <b>Business category</b> |     |   |  |  |  |   |   |
| Small business           | 235 | 83%   | 3%   | 14%  | 52%  | 9%  | 38%   |
| Medium/large business    | 20  | 53%   | 41%  | 6%   | 100%   | 0%  | 0%  |

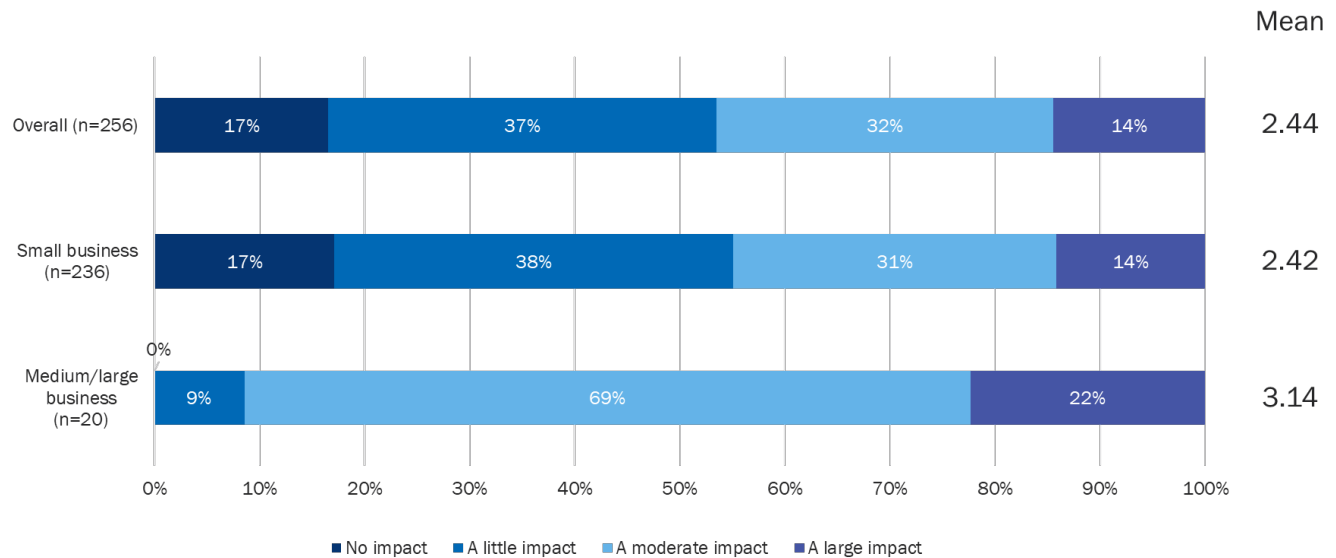
Note: Results based on phone survey data

## 6.3 Energy Efficiency Intention and Concern

The Study Team asked respondents how much they felt energy costs affected the annual operating budget or annual revenue/profits of their business/organization on a scale of 1 “No impact” to 4 “A large impact.” Figure 2 presents the percentage breakdown by response option and mean scores by business category.

- An overall mean score of 2.44 suggests that, on average, respondents felt energy costs had between “A little impact” and “A moderate impact” on their operating budget, revenue and profits.
- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (3.14 vs. 2.42), suggesting the operating budget/revenue/profits of the medium/large business category is more greatly impacted by energy costs than the operating budget/revenue/profits of the small business category.
- 17% of small businesses indicated that their energy costs have “No impact” on their operating budget or revenue. This translates to small business customers having little financial concern about reducing their energy bills.

Figure 2. Impact of Energy Costs on Annual Operating Budget, Revenue and Profits

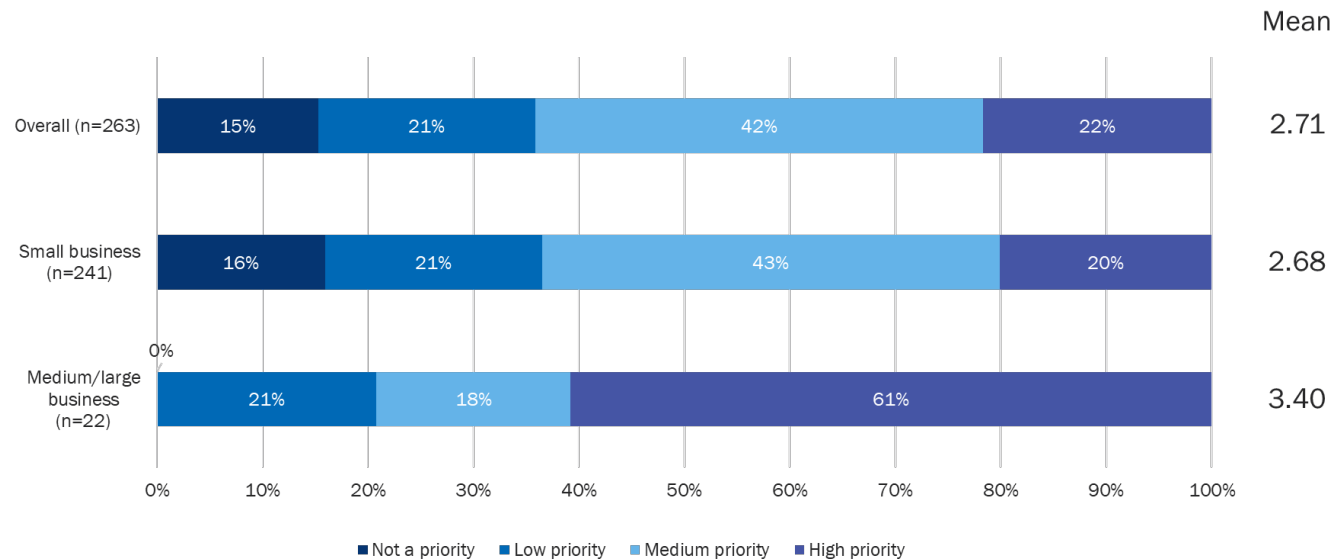


Note: Results based on phone survey data

The Study Team asked respondents how much of a priority managing energy costs was to their business/organization on a scale of 1 “Not a priority” to 4 “High priority.” Figure 3 presents the percentage breakdown by response option and mean scores by business category.

- An overall mean score of 2.71 suggests that, on average, respondents see managing their energy costs as slightly below a “Medium priority.”
- Medium/large businesses/organizations had a higher mean score compared to small businesses/organizations (3.40 vs. 2.68), suggesting the medium/large business category sees managing their energy costs as a higher priority than their counterpart.

Figure 3. Level of Priority Managing Energy Costs



Note: Results based on phone survey data

The Study Team asked respondents if they would describe their business/organization as “Particularly concerned” or “Not particularly concerned” about affording their energy costs. Table 37 presents the percentage of respondents who indicated each option by business category.

- Over half of respondents (57%) indicated they were “Not particularly concerned” about affording their energy costs.
- Medium/large businesses/organizations were more likely than small businesses/ organizations to indicate they were “Particularly concerned” about affording their energy costs.

Table 37. Concern About Affording Energy Costs

|                          | n   | Particularly Concerned | Not Particularly Concerned |
|--------------------------|-----|------------------------|----------------------------|
| Overall                  | 275 | 43%                    | 57%                        |
| <b>Business category</b> |     |                        |                            |
| Small business           | 251 | 41%                    | 59%                        |
| Medium/large business    | 24  | 74%                    | 26%                        |

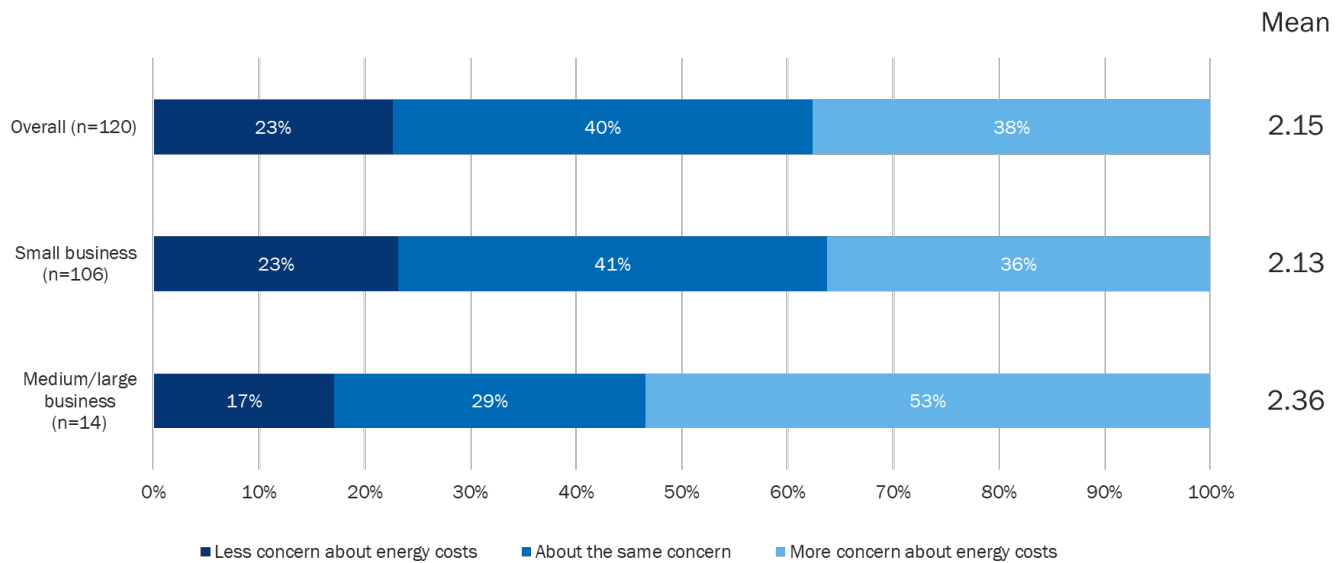
Note: Results based on phone survey data

The Study Team asked respondents who indicated their business/organization was “Particularly concerned” about affording their energy costs how their concern about energy costs compared to their concern for other expenses for which they were responsible. This was measured on a scale of 1 “Less concern about energy costs” to 3 “More concern about energy costs.” Figure 4 presents the percentage breakdown by response option and mean scores by business category.

- An overall mean score of 2.15 suggests that, on average, respondents have slightly more concern about energy costs than they do about their other expenses.

- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (2.36 vs. 2.13), suggesting the medium/large business category was more concerned about their energy costs compared to their other expenses than their counterpart.

Figure 4. Concern Over Energy Costs Compared to Concern Over Other Expenses



Note: Results based on phone survey data: respondents who indicated their business/organization was "Particularly concerned" about affording their energy costs

## Awareness, Concern, and Other Barriers

The Study Team asked respondents who indicated energy costs were less than a “High priority” or indicated they had “Less concern about energy costs” compared to other expenses to specify their other priorities/bigger concerns. Table 38 and Table 39 present the percentage of respondents who indicated each priority by business category.

- Overall, approximately one-fourth (26%) of respondents indicated that, in terms of spending, employee compensation was a higher priority than energy costs. Other higher priorities included critical building repairs (16%), cosmetic upgrades (13%), rent/lease/mortgage (12%), hiring/keeping employees (12%), and paying down debt (10%).

Table 38. Part 1: Bigger Concerns/Priorities Over Energy Costs

|                          | n   | Employee Pay, Bonuses or Other Compensation, Like a Company Party or Gift | Critical Building Repairs, Like a New Roof or New Windows | Cosmetic Upgrades to the Business, Like Space Renovations | Rent, Lease or Mortgage Costs | Hiring a New Employee or Keeping a Current Employee | Paying Down Debt, Such as Credit Cards, Loans, or Past Due Amounts on Bills | Other |
|--------------------------|-----|---|---|---|-------------------------------|---|---|-------|
| Overall                  | 254 | 26%   | 16%   | 13%   | 12%                           | 12%   | 10%   | 8%    |
| <b>Business category</b> |     |   |   |   |                               |   |   |       |
| Small business           | 248 | 27%   | 16%   | 13%   | 12%                           | 13%   | 10%   | 8%    |
| Medium/large business    | 6   | 17%   | 7%  | 14%   | 7%                            | 1%  | 0%  | 4%    |

Note: Results based on phone survey data: respondents who indicated energy costs were less than a “High priority” or indicated they had “Less concern about energy costs” compared to other expenses

Table 39. Part 2: Bigger Concerns/Priorities Over Energy Costs

|                          | n   | Marketing | Technology Upgrades, Like Security Systems, New Computers, or Better Internet | Put It in a Savings Account | Upgrades to Heating and Cooling Equipment | Goods/Operating Costs | Providing Additional Products or Services for Customers/Cienteles | Other Equipment Upgrades | Offers Sales, Discounts, or Other Promotions to Your Customers/Cienteles |
|--------------------------|-----|-----------|---|-----------------------------|---|-----------------------|---|--------------------------|--|
| Overall                  | 254 | 7%        | 7%  | 6%                          | 6%  | 6%                    | 4%  | 3%                       | 2%   |
| <b>Business category</b> |     |           |   |                             |   |                       |   |                          |  |
| Small business           | 248 | 7%        | 7%  | 6%                          | 6%  | 6%                    | 4%  | 4%                       | 2%   |
| Medium/large business    | 6   | 7%        | 8%  | 0%                          | 7%  | 0%                    | 7%  | 0%                       | 7%   |

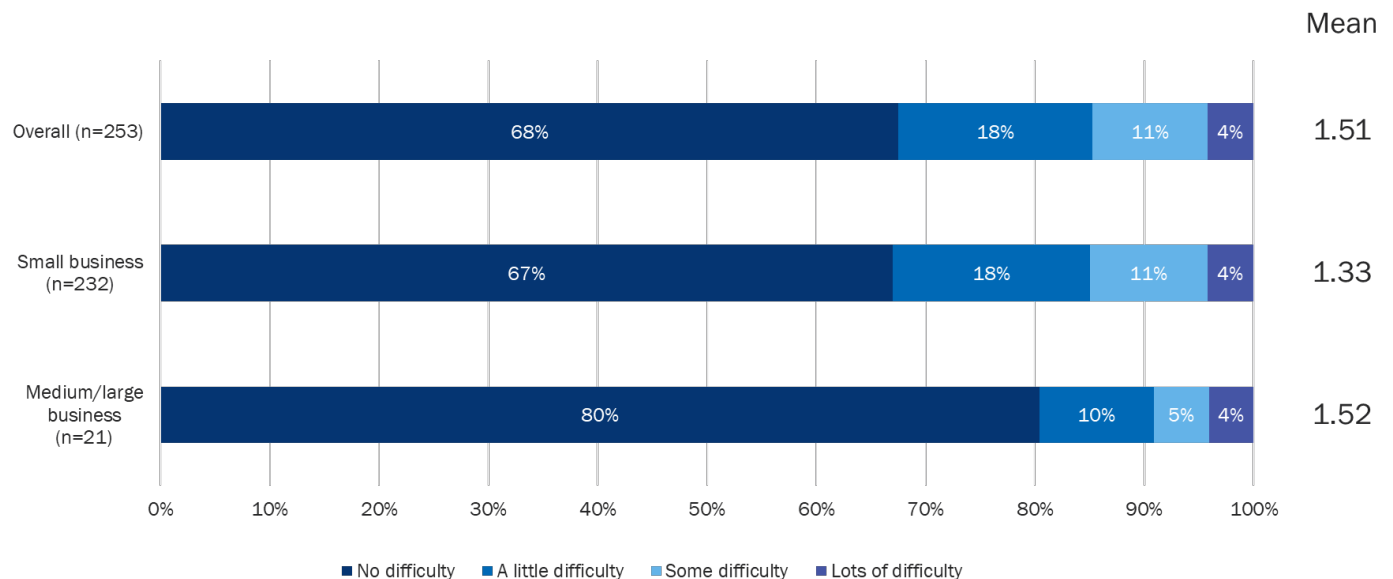
Note: Results based on phone survey data: respondents who indicated energy costs were less than a “High priority” or indicated they had “Less concern about energy costs” compared to other expenses



The team asked respondents how much difficulty they had affording their business' or organizations' energy costs in the past two years on a scale of 1 "No difficulty" to 5 "Lots of difficulty." Figure 5 presents the percentage breakdown by response option and mean scores by business category.

- Overall, 68% of respondents indicated that their business/organization had "No difficulty" affording their energy costs.
- An overall mean score of 1.51 suggests that businesses/organizations had between "No difficulty" and "A little difficulty" affording their energy costs.
- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (1.33 vs. 1.52), suggesting the medium/large business category had more difficulty affording their energy costs than their counterpart.

Figure 5. Difficulty Affording Energy Costs

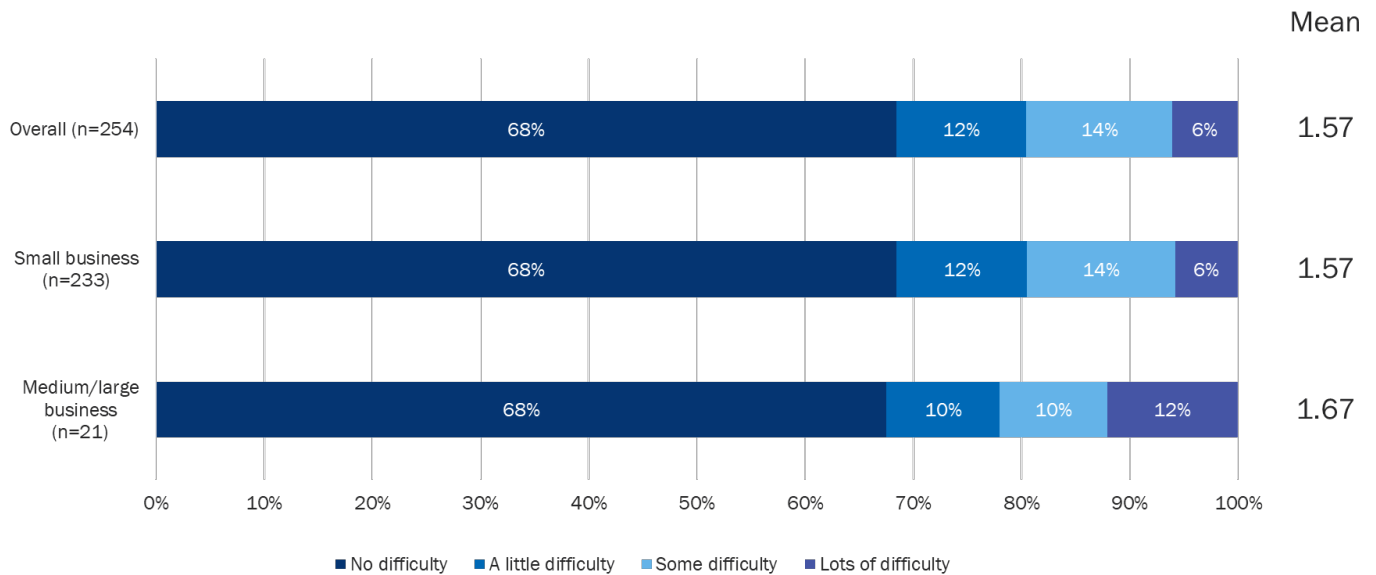


Note: Results based on phone survey data

The Study Team asked respondents how much difficulty they had maintaining comfortable indoor air temperatures in the past two years on a scale of 1 "No difficulty" to 5 "Lots of difficulty." Figure 6 presents the percentage breakdown by response option and mean scores by business category.

- Overall, 68% of respondents indicated their business/organization had "No difficulty" maintaining comfortable indoor temperatures.
- An overall mean score of 1.57 suggests that businesses/organizations had between "No difficulty" and "A little difficulty" maintaining comfortable indoor temperatures.
- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (1.67 vs. 1.57), suggesting the medium/large business category had more difficulty maintaining comfortable indoor temperatures than their counterpart.

Figure 6. Difficulty Maintaining Comfortable Indoor Air Temperatures

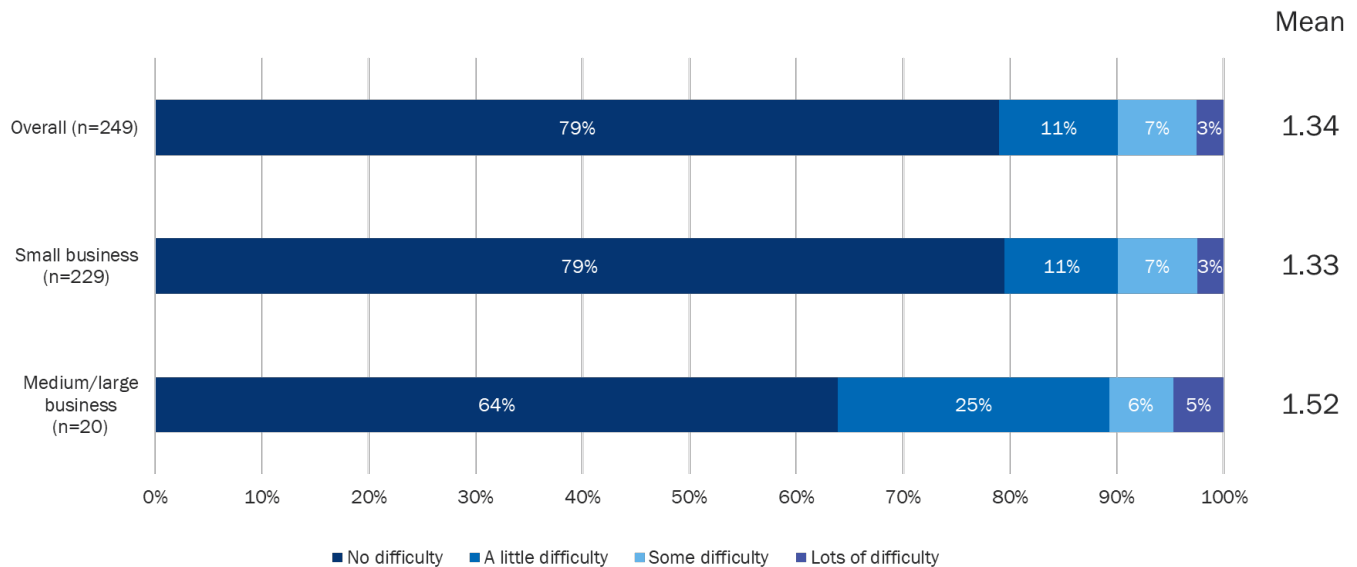


Note: Results based on phone survey data

The Study Team asked respondents how much difficulty they had operating energy-using equipment safely or replacing unsafe equipment in the past two years on a scale of 1 “No difficulty” to 5 “Lots of difficulty.” Figure 7 presents the percentage breakdown by response option and mean scores by business category.

- Overall, 79% of respondents indicated that their business/organization had “No difficulty” operating energy-using equipment safely or replacing unsafe equipment.
- An overall mean score of 1.34 suggests that businesses/organizations had between “No difficulty” and “A little difficulty” operating energy-using equipment safely or replacing unsafe equipment.
- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (1.52 vs. 1.33), suggesting the medium/large business category had more difficulty operating energy-using equipment safely or replacing unsafe equipment than their counterpart.

Figure 7. Difficulty Operating Energy-Using Equipment Safely or Replacing Unsafe Equipment

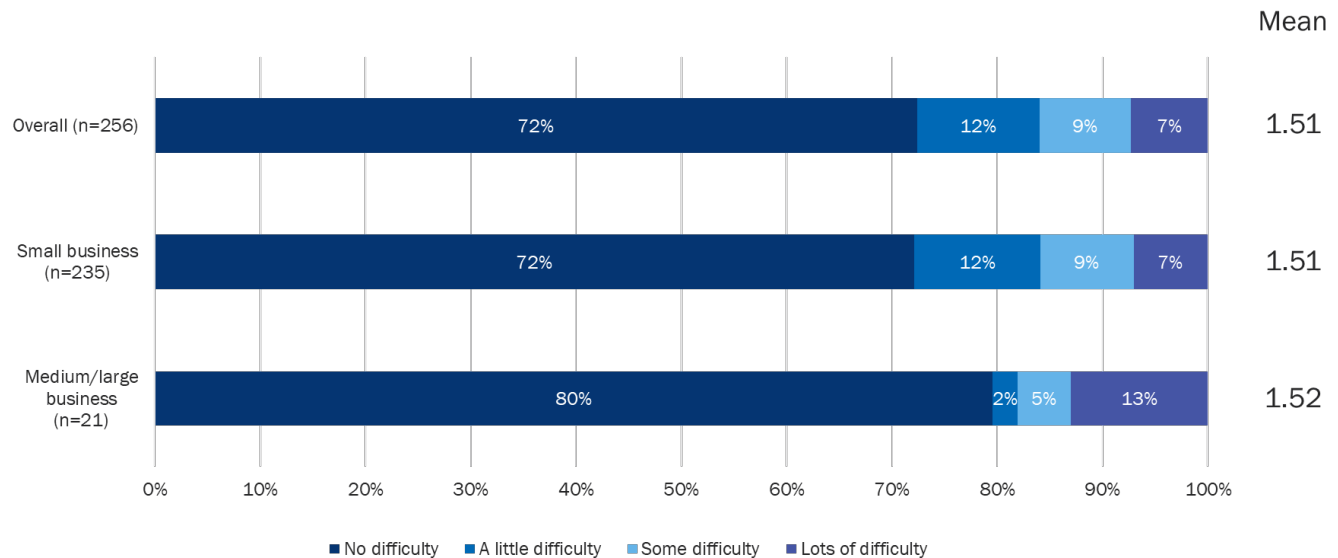


Note: Results based on phone survey data

The Study Team asked respondents how much difficulty they had keeping mold, mildew or pests such as insects, spiders and rodents out of their facility in the past two years on a scale of 1 “No difficulty” to 5 “Lots of difficulty.” This question provides an indication as to the overall condition of their facility and any health or safety needs of commercial customers, especially small business customers. Figure 8 presents the percentage breakdown by response option and mean scores by business category.

- Overall, slightly fewer than three-fourths of respondents indicated that they had “No difficulty” keeping mold, mildew and pests out of their facility.
- An overall mean score of 1.51 suggests that businesses/organizations had between “No difficulty” and “A little difficulty” keeping mold, mildew and pests out of their facility.
- There was no variation in mean score across business category, suggesting that the amount of difficulty with keeping out mold, mildew and pests is consistent across business size.

Figure 8. Difficulty Keeping Mold, Mildew or Pests, such as Insects, Spiders and Rodents, Out of Facility

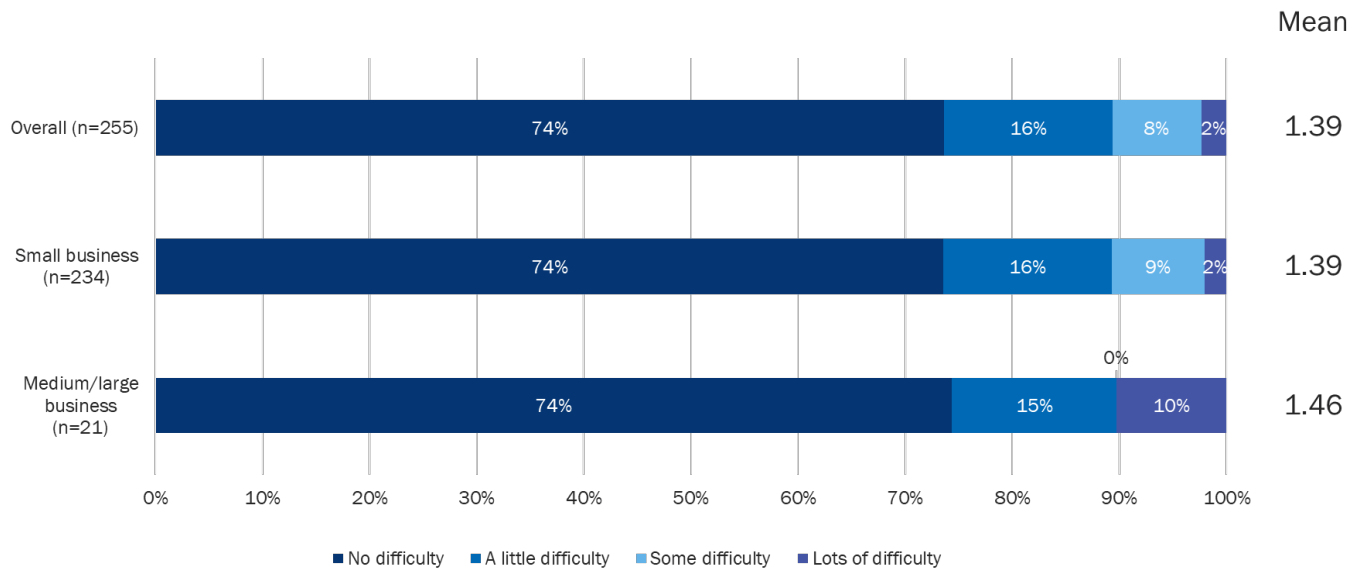


Note: Results based on phone survey data

The Study Team asked respondents how much difficulty they had providing optimal or high-quality lighting conditions for employees and customers in the past two years on a scale of 1 “No difficulty” to 5 “Lots of difficulty.” Figure 9 presents the percentage breakdown by response option and mean scores by business category.

- Overall and across business categories, three-fourths of respondents indicated that their business/organization had “No difficulty” providing optimal or high-quality lighting for their employees and customers.
- An overall mean score of 1.39 suggests that businesses/organizations had between “No difficulty” and “A little difficulty” providing optimal or high-quality lighting conditions.
- Medium/large businesses/organizations had a slightly higher mean score compared to small businesses/organizations (1.46 vs. 1.39), suggesting the medium/large business category had more difficulty providing optimal or high-quality lighting conditions than their counterpart.

Figure 9. Difficulty Providing Optimal or High-Quality Lighting Conditions for Employees and Customers



Note: Results based on phone survey data

## 7. Key Penetration Results

The following section presents weighted penetration results by end use for all study-eligible commercial customers as well as by small and medium/large premise size. Additional detail regarding equipment penetration and saturation is included in linked excel workbook found in Appendix A.

### 7.1 Lighting

Table 40 presents results on the penetration of different types of lighting in DESC's commercial customer buildings.

Table 40. Summary of Lighting Penetration

| Type                                   | Penetration |            |              |
|--|-------------|------------|--------------|
|  | Overall     | Small      | Medium/Large |
| <b>n</b>                               | <b>281</b>  | <b>255</b> | <b>26</b>    |
| Linear fluorescent                     | 70%         | 70%        | 43%          |
| Linear Fluorescent T12                 | 27%         | 27%        | 22%          |
| Linear Fluorescent T5                  | 13%         | 13%        | 15%          |
| Linear Fluorescent T8                  | 48%         | 48%        | 38%          |
| Linear LED                             | 34%         | 33%        | 76%          |
| Incandescent                           | 33%         | 33%        | 56%          |
| Halogen                                | 8%          | 8%         | 12%          |
| CFL                                    | 31%         | 31%        | 41%          |
| Screw-In LEDs                          | 55%         | 54%        | 63%          |
| High intensity discharge lamps         | 4%          | 4%         | 10%          |
| Exit Signs                             | 100%        | 100%       | 100%         |
| CFL Exit Signs                         | 18%         | 18%        | 18%          |
| Incandescent Exit Signs                | 49%         | 43%        | 63%          |
| LED Exit Signs                         | 33%         | 39%        | 18%          |
| Lights Controlled by Occupancy Sensors | 16%         | 16%        | 19%          |
| Lights Controlled by Bi-Level Lighting | 7%          | 6%         | 19%          |
| Daylight dimming                       | 30%         | 30%        | 23%          |
| Timing controls                        | 25%         | 19%        | 100%         |
| Exterior lighting                      | 66%         | 66%        | 85%          |

Source: Phone survey with site visit verification

## 7.2 Space Heating

Table 41 and Table 42 presents results on the penetration of different types of space heating fuel and equipment types in DESC's commercial customer buildings.

Table 41. Summary of Space Heating Penetration

| Fuel Type                         | Penetration |            |              |
|-----------------------------------|-------------|------------|--------------|
|                                   | Overall     | Small      | Medium/Large |
| <b>N</b>                          | <b>285</b>  | <b>258</b> | <b>27</b>    |
| Has heating                       | 93%         | 93%        | 100%         |
| Electric Heat                     | 73%         | 73%        | 40%          |
| Natural Gas Heat                  | 26%         | 25%        | 68%          |
| Propane                           | 3%          | 3%         | <1%          |
| Biomass                           | 1%          | 1%         | <1%          |
| Fuel oil                          | <1%         | <1%        | <1%          |
| No Heating                        | 7%          | 7%         | <1%          |
| Primary Heating Fuel: Electricity | 69%         | 70%        | 37%          |
| Primary Heating Fuel: Natural Gas | 21%         | 20%        | 71%          |
| Primary Heating Fuel: Fuel Oil    | <1%         | <1%        | <1%          |
| Primary Heating Fuel: Propane     | 2%          | 2%         | <1%          |
| Primary Heating Fuel: Biomass     | 1%          | 1%         | <1%          |

Source: Phone survey with site visit verification

Table 42. Summary of Space Heating Equipment Penetration

|   | Penetration |            |              |
|---|-------------|------------|--------------|
|   | Overall     | Small      | Medium/Large |
| <b>N</b>  | <b>213</b>  | <b>195</b> | <b>18</b>    |
| Electric Heat                                       | 73%         | 73%        | 40%          |
| Natural Gas Heat                                    | 26%         | 25%        | 68%          |
| Average age of manufacturing (all equipment, years) | 9.1         | 9.6        | 7.5          |
| Furnace   | 10%         | 10%        | 16%          |
| Electric unit or space heater                       | 12%         | 12%        | 2%           |
| Heat pump   | 47%         | 47%        | 20%          |
| Electric resistance heaters                         | 7%          | 7%         | 10%          |
| Other   | 1%          | 1%         | 0%           |

Source: Phone survey with site visit verification



## 7.3 Cooling Systems

Table 43 presents space cooling equipment penetration in DESC's commercial customer buildings.

Table 43. Summary of Space Cooling Penetration

|  | Penetration |            |              |
|--|-------------|------------|--------------|
|  | Overall     | Small      | Medium/Large |
| <b>N</b>                                 | <b>253</b>  | <b>226</b> | <b>27</b>    |
| Has air conditioning                     | 83%         | 82%        | 100%         |
| Average SEER for CAC                     | 13.8        | 13.7       | 14.2         |
| Average age of CAC manufacturing (years) | 10.0        | 9.8        | 10.6         |
| Packaged system AC                       | 46%         | 45%        | 65%          |
| Split system AC                          | 36%         | 36%        | 22%          |
| Heat pump                                | 43%         | 43%        | 39%          |
| Ductless Minisplit                       | 6%          | 6%         | 14%          |
| Chiller                                  | 1%          | 1%         | 22%          |
| Window or wall AC                        | 5%          | 4%         | 14%          |
| Other Cooling                            | 1%          | 1%         | <1%          |

Source: Phone survey with site visit verification

## 7.4 Ventilation

Table 44 presents ventilation penetration in DESC's commercial customer buildings.

Table 44. Summary of Ventilation Penetration

|                                       | Penetration |            |              |
|---------------------------------------|-------------|------------|--------------|
|                                       | Overall     | Small      | Medium/Large |
| <b>n</b>                              | <b>259</b>  | <b>242</b> | <b>27</b>    |
| Ventilation Varies Based on Occupancy | 6%          | 6%         | 35%          |
| <b>n</b>                              | <b>279</b>  | <b>255</b> | <b>27</b>    |
| Ventilation hoods                     | 29%         | 28%        | 84%          |
| <b>n</b>                              | <b>77</b>   | <b>62</b>  | <b>18</b>    |
| Variable fan speed                    | 9%          | 8%         | 29%          |

Source: Phone survey with site visit verification

## 7.5 Thermostats

Table 45 presents thermostat penetration in DESC's commercial customer buildings.

Table 45. Summary of HVAC Controls Penetration

|                   | Penetration |            |              |
|-------------------|-------------|------------|--------------|
|                   | Overall     | Small      | Medium/Large |
| <b>n</b>          | <b>266</b>  | <b>248</b> | <b>18</b>    |
| Smart thermostats | 9%          | 9%         | 7%           |

Source: Phone survey with site visit verification

## 7.6 EMS

Table 46 presents energy management system penetration in DESC's commercial customer buildings.

Table 46. Summary of EMS Penetration

|   | Penetration |            |              |
|---|-------------|------------|--------------|
|   | Overall     | Small      | Medium/large |
| <b>n</b>                                    | <b>284</b>  | <b>263</b> | <b>21</b>    |
| Has EMS                                     | 1%          | 1%         | 9%           |
| EMS controls lighting                       | <1%         | <1%        | 6%           |
| EMS controls cooling                        | 1%          | <1%        | 9%           |
| EMS controls heating                        | 1%          | 1%         | 9%           |
| EMS controls motors or industrial processes | <1%         | <1%        | 2%           |
| EMS controls on-site generation             | <1%         | <1%        | 2%           |
| EMS controls refrigeration                  | <1%         | <1%        | 2%           |
| EMS controls district steam system          | <1%         | <1%        | 3%           |
| EMS controls other equipment                | <1%         | <1%        | <1%          |

Source: Phone survey with site visit verification

## 7.7 Water Heating

Table 47 and Table 48 presents water heating fuel type and equipment penetration in DESC's commercial customer buildings.

Table 47. Summary of Water Heating Penetration

| Fuel Type                   | Penetration |            |              |
|-----------------------------|-------------|------------|--------------|
|                             | Overall     | Small      | Medium/Large |
| <b>n</b>                    | <b>297</b>  | <b>271</b> | <b>26</b>    |
| Has water heating equipment | 78%         | 78%        | 90%          |
| Primary - natural gas       | 10%         | 9%         | 53%          |
| Primary - electricity       | 68%         | 68%        | 42%          |
| Primary - propane           | 1%          | 1%         | 1%           |

Source: Phone survey with site visit verification

Table 48. Summary of Water Heating Equipment Penetration

| Equipment Type                             | Penetration |            |              |
|--|-------------|------------|--------------|
|  | Overall     | Small      | Medium/Large |
| <b>n</b>                                   | <b>197</b>  | <b>176</b> | <b>21</b>    |
| Primary - electricity                      | 68%         | 68%        | 42%          |
| Primary - natural gas                      | 10%         | 9%         | 53%          |
| Storage water heater with dedicated heater | 59%         | 59%        | 68%          |
| Indirect storage water heater              | 6%          | 6%         | 7%           |
| Tankless water heater                      | 10%         | 10%        | 24%          |
| Heat pump water heater                     | 3%          | 2%         | 18%          |
| Other water heater                         | 2%          | 3%         | 1%           |

Source: Phone survey with site visit verification

## 7.8 Refrigeration

Table 49 presents refrigeration penetration in DESC's commercial customer buildings.

Table 49. Summary of Refrigeration Penetration

|                                  | Penetration |            |              |
|----------------------------------|-------------|------------|--------------|
|                                  | Overall     | Small      | Medium/Large |
| <b>n</b>                         | <b>298</b>  | <b>273</b> | <b>25</b>    |
| Has commercial refrigeration     | 14%         | 13%        | 72%          |
| Refrigerated non-display cases   | 14%         | 12%        | 69%          |
| Refrigerated display cases       | 9%          | 8%         | 30%          |
| Commercial refrigerated walk-ins | 3%          | 3%         | 30%          |
| Refrigerated Vending Machines    | 7%          | 6%         | 37%          |
| Standalone Ice Machines          | 21%         | 20%        | 81%          |

Source: Phone survey with site visit verification

## 7.9 Commercial Kitchen and Food Service Equipment

Table 50 presents commercial food service equipment penetration across DESC's commercial customer buildings.

Table 50. Summary of Commercial Kitchen Equipment Penetration

| Food service equipment | Penetration |            |              |
|------------------------|-------------|------------|--------------|
|                        | Overall     | Small      | Medium/Large |
| <b>n</b>               | <b>298</b>  | <b>273</b> | <b>25</b>    |
| Ovens                  | 14%         | 12%        | 75%          |
| Griddles               | 4%          | 3%         | 38%          |
| Commercial Fryers      | 3%          | 2%         | 40%          |
| Infrared Broilers      | 4%          | 3%         | 37%          |
| Holding Cabinets       | 1%          | 0.5%       | 25%          |
| Steamers               | 2%          | 2%         | 53%          |
| Dishwashing equipment  | 12%         | 10%        | 76%          |

Source: Phone survey with site visit verification

## 7.10 Renewables, On-Site Generation, Cool Roofs, and Window Film

Table 51 presents renewable energy penetration for DESC's commercial customer buildings. Combined heat and power (CHP) or cogeneration not only generates electricity through renewable sources, it also uses the heat by-product generated through this process.

Table 51. Summary of On-Site Generation Penetration

|                             | Penetration |           |              |
|-----------------------------|-------------|-----------|--------------|
|                             | Overall     | Small     | Medium/Large |
| <b>n</b>                    | <b>23</b>   | <b>14</b> | <b>9</b>     |
| Renewable energy generation | 2%          | 0%        | 25%          |
| Emergency/backup generation | 59%         | 50%       | 100%         |
| Cogeneration/CHP            | 8%          | 6%        | 25%          |

Source: On-site Visits

The Study Team asked respondents if their facility had a cool roof installed. Table 52 presents the percentage of respondents who indicated their facility had a cool roof by business category.

- Slightly fewer than one-fifth of respondents indicated their facility had a cool roof (19%).
- Small business facilities were more likely than medium/large business facilities to indicate they had a cool roof (20% vs. 12%).

Table 52. Presence of Cool Roof

|                          | <b>n</b> | <b>Cool Roof Installed</b> |
|--------------------------|----------|----------------------------|
| Overall                  | 229      | 19%                        |
| <b>Business category</b> |          |                            |
| Small business           | 211      | 20%                        |
| Medium/large business    | 18       | 13%                        |

Note: Results based on phone survey data

The team asked respondents if they had any window films or sun control films installed at their facility. Table 53 presents the percentage of respondents who indicated their facility had window and/or sun control films installed by business category.

- Slightly more than one-fourth of respondents indicated their facility had any window films/sun control films (27%).
- Medium/large business facilities were more likely than small business facilities to indicate they had window films/sun control films (43% vs. 26%).

Table 53. Presence of Window Films/Sun Control Films

|                          | <b>n</b> | <b>Window Films/Sun Control Films Installed</b> |
|--------------------------|----------|---|
| Overall                  | 260      | 27%   |
| <b>Business category</b> |          |   |
| Small business           | 238      | 26%   |
| Medium/large business    | 22       | 43%   |

Note: Results based on phone survey data

## 7.11 Electric Vehicles

The Study Team found that less than one percent of customers included in the phone surveys and on-site visits have commercial EVs and associated infrastructure. Given the small sample size subject to primary data collection, the Study Team instead relied on secondary data sources to present EV penetration and existing charging infrastructure in DESC territory. Key findings from secondary data sources include the following:

- As of May 2021, there are 414 public EV charging stations in South Carolina and 929 EV charging ports (90 of which are private and therefore likely residential)<sup>11</sup>
- Between 2016 and 2018, South Carolina vehicle registrations for EVs and PHEVs was 4,275 and 1,945 EVs and 5,208, respectively. This represents less than half of a percent of all vehicle registrations in the state during this time period.<sup>12</sup>

## 7.12 Building Characteristics

The Study Team asked respondents what year their facility was built. Those who could not provide an estimated year were asked to select a range. Table 54 presents the average year facilities were built by business category.

- Overall, the average facility was built in 1974.
- Small business facilities are older than medium/large business facilities (1973 vs. 1994).

Table 54. Year Facility Was Built

|                          | n   | Year Built |
|--------------------------|-----|------------|
| Overall                  | 237 | 1974       |
| <b>Business category</b> |     |            |
| Small business           | 216 | 1973       |
| Medium/large business    | 21  | 1994       |

Note: Results based on phone survey data

The team asked respondents how many floors their facility had. Table 55 presents the number of floors in facilities by business category.

- Overall, facilities averaged one floor.
- Medium/large business facilities had more floors than small business facilities (three floors vs. one floor).

Table 55. Number of Floors

|                          | n   | Floors |
|--------------------------|-----|--------|
| Overall                  | 274 | 1      |
| <b>Business category</b> |     |        |
| Small business           | 250 | 1      |
| Medium/large business    | 24  | 3      |

Note: Results based on phone survey data

<sup>11</sup> U.S. Department of Energy, Alternative Fuels Data Center: <https://afdc.energy.gov/states/sc>. Accessed May 4, 2022

<sup>12</sup> U.S. Department of Energy, Alternative Fuels Data Center: South Carolina Vehicle Data: <https://energy.sc.gov/node/3084>. Accessed May 4, 2022

The Study Team asked respondents how many hours per day their facility was occupied on weekdays and weekends. Table 56 presents the average number of hours facilities were occupied on weekdays and weekends by business category.

- Overall, facilities were occupied for longer on weekdays than weekends (9.87 hours vs. 6.64 hours).
- Medium/large business facilities were occupied for longer than small business facilities on both weekdays and weekends (9.48 vs. 17.70 and 6.14 vs. 17.17, respectively).
- Small business facilities were occupied for approximately three more hours on weekdays than weekends. Medium/large business facilities were occupied for approximately the same number of hours on weekdays and weekends.

Table 56. Hours Occupied

|                          | n       | Hours Occupied Weekday | Hours Occupied Weekend |
|--------------------------|---------|------------------------|------------------------|
| Overall                  | 268-270 | 9.87                   | 6.64                   |
| <b>Business category</b> |         |                        |                        |
| Small business           | 246-247 | 9.48                   | 6.14                   |
| Medium/large business    | 22-23   | 17.70                  | 17.17                  |

Note: Results based on phone survey data

The team asked respondents if their facility had parking. Table 57 presents the percentage of respondents who indicated their facility had parking by business category.

- Overall, 84% of respondents indicated their facility had parking.
- All medium/large business respondents indicate their facility had parking.

Table 57. Presence of Parking

|                          | n   | Has Parking |
|--------------------------|-----|-------------|
| Overall                  | 275 | 84%         |
| <b>Business category</b> |     |             |
| Small business           | 251 | 84%         |
| Medium/large business    | 24  | 100%        |

Note: Results based on phone survey data

The Study Team asked those respondents with parking at their facility to approximate how many parking spaces they had. Table 58 presents the average number of parking spaces broken down by business category.

- Overall, facilities with parking averaged 39 parking spots.
- Medium/large business facilities had more parking spots than small business facilities (150 parking spaces vs. 36 parking spaces).



Table 58. Number of Parking Spaces

|                          | n   | Number of<br>Parking Spots |
|--------------------------|-----|----------------------------|
| Overall                  | 198 | 39                         |
| <b>Business category</b> |     |                            |
| Small business           | 181 | 36                         |
| Medium/large business    | 17  | 150                        |

Note: Results based on phone survey data: respondents who had parking

The team asked those respondents with parking at their facility to estimate the distance (in feet) from the facility's closest parking to a power source, such as a utility panel or transformer. Table 59 presents the average distance in feet from facilities' closest parking to a power source by business category.

- Overall, facilities' closest parking spaces were 55.08 feet from a power source.
- Small business facilities' closest parking was closer to a power source than medium/large business facilities' closest parking (54.30 feet vs. 72.37 feet).

Table 59. Distance from Parking to Power Source

|                          | n   | Distance in feet<br>from Parking Spots<br>to Power Source |
|--------------------------|-----|---|
| Overall                  | 160 | 55.08   |
| <b>Business category</b> |     |   |
| Small business           | 145 | 54.30   |
| Medium/large business    | 15  | 72.37   |

Note: Results based on phone survey data: respondents who had parking

## 8. Electric Vehicle Infrastructure and Planning

As part of this market study, the team explored customer interest and energy-saving potential as a result of increased use of EVs. A foundational step in this research involved understanding the existing infrastructure related to EVs for commercial customers.

Table 60 and Table 61 present results on the existing fleet and parking infrastructure that could potentially accommodate EVs for commercial buildings in DESC territory.

- Overall, 16% of respondents indicated their business had fleet vehicles, of businesses that had fleet vehicles 82% had fleet vehicle parking.
- Medium/large businesses were more likely than small businesses to have fleet vehicles (68% vs. 14%).
- Of businesses with fleet vehicles, medium/large businesses were more likely than small businesses to have fleet parking (100% vs. 66%).

Table 60. Summary of fleet vehicle penetration for commercial customers

| Fleet vehicles  | Penetration |            |               |
|---|-------------|------------|---------------|
|   | Overall     | Small      | Medium /Large |
| <b>n</b>  | <b>269</b>  | <b>248</b> | <b>21</b>     |
| Has fleet vehicles  | 16%         | 14%        | 68%           |
| Class 1 Vehicles: sedan, small sport utility vehicles/SUVs, small crossover, small pickup truck                   | 5%          | 5%         | 13%           |
| Class 2a-2b vehicles: sport utility vehicle, pickup truck, small delivery van                                     | 5%          | 4%         | 30%           |
| Class 3 trucks: walk-in van, city delivery van  | 2%          | 2%         | 0%            |
| Class 4-5 trucks: box truck, city delivery van, step van  | 3%          | 2%         | 22%           |
| Class 6 trucks: beverage truck, rack truck  | 1%          | 1%         | 0%            |
| Class 7-8 trucks: short-haul truck, long-haul truck   | 3%          | 3%         | 0%            |
| School bus  | 1%          | 1%         | 4%            |
| Transit bus   | <1%         | 0%         | 1%            |
| On-road specially vehicles: fire truck, ambulance, recreational vehicle, refuse truck, drayage truck)             | <1%         | 0%         | <1%           |
| Transport refrigeration units: refrigeration unit for warehouses, distribution centers, excluding tractor trailer | 1%          | 0%         | 16%           |
| Other vehicle   | <1%         | 0%         | 4%            |

Note: Results based on phone survey data

Table 61. Summary of parking infrastructure for fleet vehicles

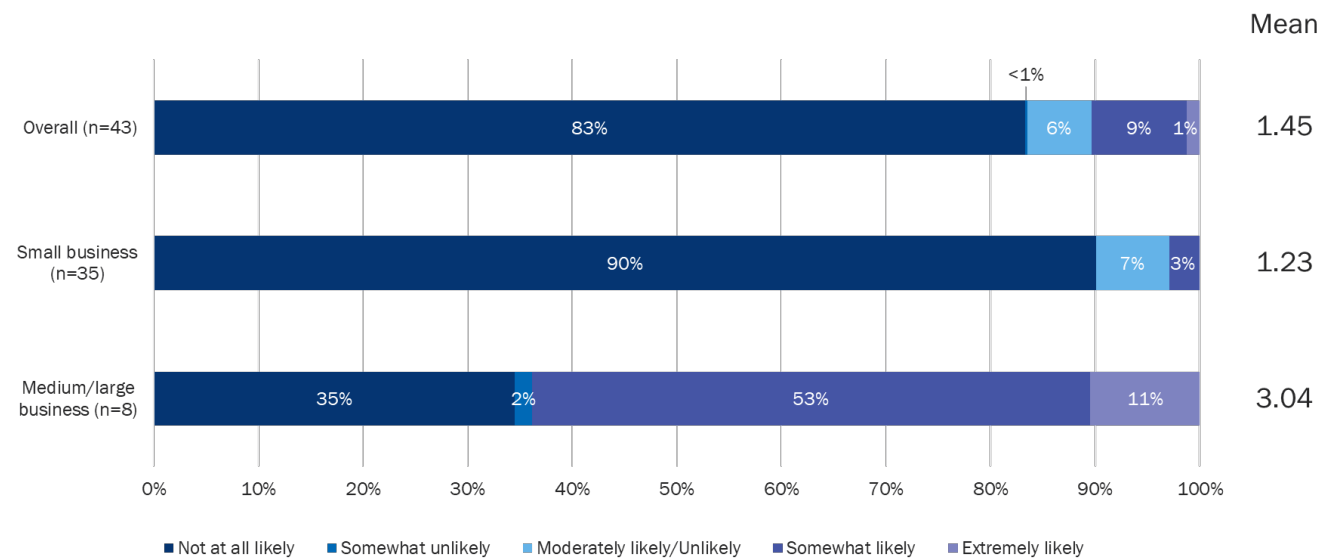
| Parking infrastructure                    | Penetration  |              |              |
|---|--------------|--------------|--------------|
|   | Overall      | Small        | Medium/large |
| <b>n</b>                                  | <b>38-46</b> | <b>32-36</b> | <b>6-10</b>  |
| Has fleet vehicle parking                 | 82%          | 66%          | 100%         |
| 1 fleet vehicle parking spot              | 5%           | 4%           | 15%          |
| 2 to 25 fleet vehicle parking spots       | 46%          | 48%          | 24%          |
| 26 to 100 fleet vehicle parking spots     | 8%           | 8%           | 0%           |
| More than 100 fleet vehicle parking spots | 5%           | 0%           | 61%          |

Note: Results based on phone survey data: respondents that indicated having fleet vehicles

## 8.1 EV Fleet Interest

The Study Team gauged electric-vehicle fleet interest among commercial customers with fleet vehicles by asking respondents to rate their likelihood to purchase an EV in the next two years. As shown in Figure 10, 83% of respondents indicated their business was “Not at all likely” to purchase an EV to add to their existing fleet. An overall mean score of 1.45 suggests that respondents’ likelihood to purchase an EV was, on average, between “Not at all likely” and “Somewhat unlikely”.

Figure 10. Likelihood of Purchasing an EV for Existing Fleet



Note: Results based on phone survey data: respondents that indicated having fleet vehicles

Respondents that indicated their business was at least “Somewhat likely” to purchase an EV for their fleet were asked what type of EV they would purchase, how many, and the time frame for the purchase. Of the 43 respondents that indicated their likelihood to purchase an EV, only 6 were at least “Somewhat likely” to do so. Figure 11 presents the type/number of EVs the 6 respondents indicated they were likely to purchase, as well as when they would make said purchase.

Figure 11. Somewhat Likely EV Purchases by Respondent

**Respondent 1**

- 1 class 1 vehicle and 1 class 2a-2b vehicle more than one year from now

**Respondent 2**

- 1 class 4-5 vehicle more than one year from now

**Respondent 3**

- Unknown type and number of EV(s) within the next 6 months

**Respondent 4**

- 1 class 2a-3b vehicle in an unknown amount of time

**Respondent 5**

- 1 transit bus more than one year from now

**Respondent 6**

- Unknown type and number of EV(s) more than one year from now

Note: Results based on phone survey data: respondents that indicated having fleet vehicles and were at least "Somewhat likely" to purchase an EV to add to their fleet

## 9. Summary of Commercial EE Adoption Curve Results

This section includes commercial adoption curve results by small and medium/large commercial premises. These results are estimated based on respondents' willingness-to-participate and are adjusted by financial barriers, non-financial barriers and awareness. These estimates serve as the starting point for the adoption inputs into DESC's 2022 DSM potential model. Additional details on adoption curve methodology can be found in section 3.6.

### 9.1 EE HVAC Adoption Results

Table 62 displays the commercial adoption curves for energy-efficient HVAC systems broken down by business category.

- **EE HVAC major investment:** When the payback period was longest, adoption trended higher for medium/large businesses than small businesses, differing by 7%. However, at five years the adoption rate was equal across business category (30%). As the payback period continued to decrease, adoption increased more for small businesses than medium/large businesses, ending with a 7% difference in adoption at a payback period of zero years.
- **EE HVAC minor investment:** Adoption rate showed consistent growth and was consistent across business category, suggesting that small and medium/large businesses do not differ in their willingness to adopt EE HVAC in different payback period scenarios.
- Overall, both major and minor EE HVAC investment adoption rates show consistent growth with decreasing payback period. An adoption rate of 45% for a major investment and 43% for a minor investment with a payback period of zero years suggests that there are additional factors beyond financing that affect businesses willingness-to-participate. Overall awareness of DESC programs was 40% for all respondents and 55% for in-market respondents, though "Lack of knowledge of options" had one of the highest average ratings for how much of a barrier to participation it presented compared to other non-financial barriers. Mitigating other non-financial barriers such as limited upsides as renter, difficulty finding contractors, potential negative impacts on aesthetics or operations, and limitations due to building characteristics present a potential opportunity to increase adoption beyond what is projected.

Table 62. HVAC Business Adoption Curve Results

|                       | n  | Payback Period |         |         |        |         |
|-----------------------|----|----------------|---------|---------|--------|---------|
|                       |    | 10 Years       | 5 Years | 3 Years | 1 Year | 0 Years |
| Major investment      |    |                |         |         |        |         |
| Overall               | 81 | 19%            | 29%     | 35%     | 41%    | 45%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 75 | 19%            | 30%     | 36%     | 41%    | 46%     |
| Medium/large business | 6  | 26%            | 30%     | 35%     | 38%    | 41%     |
| Minor investment      |    |                |         |         |        |         |
| Overall               | 81 | 23%            | 30%     | 35%     | 41%    | 43%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 75 | 23%            | 30%     | 36%     | 41%    | 44%     |
| Medium/large business | 6  | 17%            | 30%     | 35%     | 38%    | 41%     |

Note: Results based on phone survey data

## 9.2 EE Lighting Adoption Results

Table 63 displays the commercial adoption curves for energy-efficient lighting broken down by business category.

- **EE lighting major investment:** When the payback period was longest, adoption trended higher for medium/large businesses than small businesses, differing by 6%. However, at five years the adoption rate was nearly equal across business category (29% vs. 30%). As the payback period continued to decrease, adoption increased more for small businesses than medium/large businesses, ending with a 11% difference in adoption at a payback period of zero years.
- **EE lighting minor investment:** Adoption rate was nearly equal across business category at payback periods of ten years and five years (22% vs. 23% and 29% vs. 29% respectively). For payback periods shorter than five years, as the payback period decreased, adoption increased more for small businesses than medium/large businesses, ending with a 10% difference in adoption at a payback period of zero years.
- Overall, both major and minor EE lighting investment adoption rates show consistent growth with decreasing payback period. As previously mentioned, the projected adoption rate of 45% for a major investment and 44% for a minor investment with a payback period of zero years could be increased by increasing general program awareness and knowledge of specific program options and by taking steps to mitigate businesses' perceived non-financial barriers,

Table 63. Lighting Business Adoption Curve Results

|                       | n   | Payback Period |         |         |        |         |
|-----------------------|-----|----------------|---------|---------|--------|---------|
|                       |     | 10 Years       | 5 Years | 3 Years | 1 Year | 0 Years |
| Major investment      |     |                |         |         |        |         |
| Overall               | 159 | 19%            | 29%     | 35%     | 40%    | 45%     |
| Business category     |     |                |         |         |        |         |
| Small business        | 148 | 19%            | 29%     | 35%     | 41%    | 46%     |
| Medium/large business | 11  | 25%            | 30%     | 32%     | 34%    | 35%     |
| Minor investment      |     |                |         |         |        |         |
| Overall               | 159 | 21%            | 28%     | 34%     | 40%    | 44%     |
| Business category     |     |                |         |         |        |         |
| Small business        | 148 | 22%            | 29%     | 35%     | 41%    | 45%     |
| Medium/large business | 11  | 23%            | 28%     | 32%     | 34%    | 35%     |

Note: Results based on phone survey data

## 9.3 EE Refrigeration Adoption Results

Table 64 displays the commercial adoption curves for energy efficient refrigeration broken down by business category.

- **EE refrigeration major and minor investment:** Adoption trended consistently higher for small businesses than medium/large business across all payback periods. Adoption rate increased as

payback decreased, with small and medium/large business adoption increasing in comparable increments.

- Overall, both major and minor EE refrigeration investment adoption rates show consistent growth with decreasing payback period. As previously mentioned, the projected adoption rate of 36% for a major investment and 36% for a minor investment with a payback period of zero years could be increased by increasing general program awareness and knowledge of specific program options and by taking steps to mitigate businesses' perceived non-financial barriers, EE refrigeration adoption across business category and payback period is also notably lower than adoption from EE HVAC, EE lighting, and EE water heating. This suggests there may be barriers unique to refrigeration that affect adoption rates.

Table 64. Refrigeration Business Adoption Curve Results

|                       | n  | Payback Period |         |         |        |         |
|-----------------------|----|----------------|---------|---------|--------|---------|
|                       |    | 10 Years       | 5 Years | 3 Years | 1 Year | 0 Years |
| Major investment      |    |                |         |         |        |         |
| Overall               | 38 | 17%            | 23%     | 26%     | 32%    | 36%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 27 | 19%            | 24%     | 27%     | 33%    | 37%     |
| Medium/large business | 11 | 11%            | 18%     | 23%     | 27%    | 30%     |
| Minor investment      |    |                |         |         |        |         |
| Overall               | 38 | 17%            | 22%     | 26%     | 32%    | 36%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 27 | 18%            | 23%     | 27%     | 34%    | 37%     |
| Medium/large business | 11 | 11%            | 17%     | 23%     | 27%    | 30%     |

Note: Results based on phone survey data

## 9.4 EE Water Heating Adoption Results

Table 65 displays the commercial adoption curves for energy-efficient water heating broken down by business category.

- EE water heating major and minor investment:** Among small businesses adoption increased as payback period decreased. For medium/large business customers; however, adoption increased from a payback period of ten years to a period of five years, but then dipped from 37% to 31% for major investment and 36% to 31% for minor investment at three years. After this dip, adoption continued to increase as the payback period decreased, ending with only a 3% (major) and 4% (minor) difference between small business adoption and medium/large business adoption at a payback period of zero years.
- Overall, both major and minor EE water heating investment adoption rates show consistent growth with decreasing payback period. As previously mentioned, the projected adoption rate of 45% for a major investment and 45% for a minor investment with a payback period of zero years could be increased by increasing general program awareness and knowledge of specific program options and by taking steps to mitigate businesses' perceived non-financial barriers. Although DESC does not currently offer water heating prescriptive measures, this awareness adjustment is applied to account for general program awareness and calibrate adoption to better estimate current market adoption.



Table 65. Water Heating Business Adoption Curve Results

|                       | n  | Payback Period |         |         |        |         |
|-----------------------|----|----------------|---------|---------|--------|---------|
|                       |    | 10 Years       | 5 Years | 3 Years | 1 Year | 0 Years |
| Major investment      |    |                |         |         |        |         |
| Overall               | 93 | 21%            | 33%     | 37%     | 42%    | 45%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 83 | 21%            | 33%     | 38%     | 43%    | 46%     |
| Medium/large business | 10 | 24%            | 37%     | 31%     | 33%    | 42%     |
| Minor investment      |    |                |         |         |        |         |
| Overall               | 93 | 23%            | 32%     | 36%     | 41%    | 45%     |
| Business category     |    |                |         |         |        |         |
| Small business        | 83 | 23%            | 32%     | 37%     | 42%    | 46%     |
| Medium/large business | 10 | 26%            | 36%     | 31%     | 33%    | 42%     |

Note: Results based on phone survey data

## 10. Summary of Small Business Program Design and Engagement Findings

Opinion Dynamics collected additional data to better understand the unique needs and barriers of DESC's small business customers (which also includes CSIs<sup>13</sup>). The overarching objective of this research was to inform the future design of the SBES and/or new small business offerings; as well as identify potential improvements to small business engagement strategies. To this end, the team synthesized results from a focused literature review, in-depth interviews with community leaders, DESC staff interviews, and specific questions on the web survey. Table 66 summarizes the research questions, key findings, and recommendations from the deep dive, with detailed findings presented subsequently.

Table 66. Summary of Small Business Deep Dive Findings and Recommendations

| Research Question(s)   | Key Findings  | Recommendations for Future Small Business Program Design and Engagement Strategies   |
|--|---|--|
| <b>Underserved segments</b>  |   |  |
| Which segments or regions have been historically underserved by DESC programs? | <p><b>Segments:</b> The vast majority of DESC business customers (approximately 93.8K out of 96.4K) are small businesses. Offices are the single largest segment (approximately 20K customers), followed by education, assembly, and hospitality (approximately 10K customers). Food service is a relatively small segment (4K customers) but is larger than many of the segments subsumed into the category "other."</p> <p><b>Energy Usage:</b> On average, small businesses have much lower energy usage per square foot (12.9 KWH/sq. ft.) compared to medium (76.2 KWH/sq. ft.) or large (797.8 KWH/sq. ft.) businesses; and they spend a smaller percentage of their annual revenues on energy costs (1%) compared to medium/large businesses (6%).</p> <p><b>Food Service:</b> Food service may be a particularly high-need segment. Nearly half (44%) of small businesses in this segment are high energy users; a much greater proportion compared to any other small business segment (12% to 27%). Food service also has the highest average usage per square foot (53.6 KWH/sq. ft.); more than double any other small business segment.</p> <p><b>Participation Trends:</b> A very small proportion of small businesses have participated in a DESC program (6%), especially when compared to medium and large businesses (33% and 49%, respectively). Non-participating small businesses were more likely to be in the other (60%), office (22%), or education,</p> | <ol style="list-style-type: none"> <li>1. Continue to focus on growing small business participation in DESC's portfolio. While they have considerably less energy savings potential per project, compared to medium or large businesses, they are far more numerous; and, as such, represent significant energy savings potential in the aggregate.</li> <li>2. Consider prioritizing the office segment, food service segment, and small CSIs of any segment as ways to grow SBES participation. Develop targeted outreach campaigns, partner with relevant industry associations, or add segment-specific measures (e.g., office kits) or promotional offerings (e.g., special discounts) with these segments in mind.</li> <li>3. Consider targeting Opportunity Zones.<sup>14</sup> Businesses can be targeted that fall within a National Opportunity Zone. These tracts are identified as underserved areas by census data that consider factors such as income, graduation rate and population. These zones can represent whole rural communities or small pockets within larger cities.</li> </ol> |

<sup>13</sup> A CSI is any organization providing medical, spiritual, municipal, public or emergency housing, or educational services to the local community. In most cases, these are not-for-profit enterprises and/or churches.

<sup>14</sup> Opportunity Zones are a federal program created by Congress in the Tax Cuts and Jobs Act of 2017 to encourage economic development and job creation in low-income urban and rural communities. The program provides federal tax reductions for taxpayers who invest unrealized capital gains into specialized "Opportunity Funds" which then make an investment in designated "Opportunity Zones." The zones themselves are comprised of low-income community census tracts designated by governors in every state.

| Research Question(s)   | Key Findings   | Recommendations for Future Small Business Program Design and Engagement Strategies  |
|--|--|---|
|  | assembly, and hospitality (10%) segments; compared to the retail (5%) and food service (3%). The other and education, assembly, and hospitality segments contain many types of CSIs, like municipalities, churches, and schools, which suggests that CSIs may be relatively more underserved compared to other small businesses.   |   |
| <b>Energy-Related Needs</b>  |  |   |
| <p>What are building and technology characteristics of these customers' businesses and how do they differ from other customers?</p> <p>What energy upgrades are most needed in the segment? How well aligned are program strategies with the needs of these customers? Which of these issues could DESC potentially address?</p> | <p><b>Age:</b> Small businesses tend to occupy older buildings; 63% occupy buildings built before 1990, compared to 35% of medium/large businesses. These facilities are more likely to have poorer building shell quality and outdated equipment.</p> <p><b>Equipment:</b> Small businesses had several notable differences compared to medium/large businesses in terms of energy-using equipment:</p> <ul style="list-style-type: none"> <li>Small businesses have greater opportunity for lighting upgrades. They are more likely to have linear fluorescent lighting (70% vs. 43%) and less likely to have linear LEDs (33% vs. 76%). They are less likely to have LEDs of any other kind (screw-in, exit signs, etc.). Many small businesses do not have lighting controls.</li> <li>They are also more likely to have significant opportunity for electric space and water heating upgrades. They are more likely to have electric primary heating (70% vs. 37%), and more likely to have electric water heating (68% vs 42%). Wi-Fi enabled thermostat (9%) and heat pump water heater (2%) penetration is low in this segment (and all businesses in general).</li> <li>Small businesses are much less likely to have refrigeration equipment of any kind (13% vs. 72%) or commercial cooking equipment such as ovens (12% vs. 75%).</li> </ul> | <p>4. Explore opportunities to add HVAC replacements (particularly electric heating replacements), weatherization upgrades, and heat pump water heaters as eligible SBES measures. As described further in this table (see Program Design), it may be necessary to develop an additional program that provides enhanced incentives for small businesses; and potentially limit these measures to select segments, older businesses, and/or businesses with higher usage per square foot.</p> <p>5. Continue to offer lighting and refrigeration upgrades, but do not consider refrigeration as a primary path for expanding participation. Food service equipment could be valuable for a relatively small but high need subsegment of customers.</p> |
| <b>Other Business Needs and Priorities</b>   |  |   |
| <p>What sorts of non-energy-related needs or priorities do small business customers have that must be addressed before or in tandem with EE upgrades? How important is EE in decision-making for customers in light of all other priorities</p>  | <p><b>Concern about Energy Bills:</b> Small businesses consider energy bills to be a mid-tier priority, rating energy costs as a 2.7 out of 4, on average (where 4 is a "high priority"). Over half (59%) indicated they were "Not particularly concerned" about affording their energy costs. Among those with some concern, about two-thirds (64%) said they had the same or less concern about energy bills compared to other expenses.</p> <p><b>Other Priorities:</b> Among small businesses who had greater concerns or priorities, respondents typically mentioned higher priorities related to their employees, customers/clientele, or goods and services; and employee pay/compensation (27%) was the most commonly reported higher priority. A notable minority of small businesses mentioned critical repairs (16%) or cosmetics upgrades (13%) as higher priorities; and these may be related to the building shell or energy-using equipment.</p>  | <p>6. Explore opportunities to partner with organizations, like chambers of commerce, that can potential package SBES with other types of financial or support services they provide to small businesses. See the Engagement Strategies section of this table for more recommendations on community partnerships.</p>   |

| Research Question(s)   | Key Findings   | Recommendations for Future Small Business Program Design and Engagement Strategies   |
|--|--|--|
|  | <p><b>Health, Comfort and Safety (HCS):</b> A significant minority of small business respondents experience “some” or “lots” of difficulty maintaining indoor air temperature (20%) or keeping mold/mildew and pests out of their facilities (16%). Difficulty with equipment safety and maintaining optimal lighting conditions are relatively less common.</p>   |  |
| <b>Program Design</b>  |  |  |
| <p>What services, either through DESC or others, are available to small business customers?</p> <p>How are utilities approaching the small business markets?</p> | <p><b>DESC Services:</b> DESC’s SBES Program offers a no-cost assessment followed by lighting and refrigeration upgrades, as well as HVAC system improvements (tune-ups, advanced thermostats, duct sealing and controls), with incentives up to 90% of project costs; up to a maximum cost of \$6,000. Small businesses also qualify for the EnergyWise for Your Business (EWfYB) Program, but rarely participate, as that program caters to larger business customers.</p> <p><b>Program Design:</b> Small Business Direct Install (SBDI)-like programs with lighting and refrigeration upgrades are the dominant small business program model in the industry (all 10 utilities the team reviewed have it). Half the utilities the team reviewed have added enhanced HVAC and/or weatherization incentives for small businesses. A few others use more innovative models: business online store, virtual commissioning, and business energy reports; the latter two designs leverage advanced metering infrastructure (AMI) data.</p> <p><b>Additional Design Considerations:</b> This research revealed a number of additional best practices regarding small business program design:</p> <ul style="list-style-type: none"> <li>Provide a wide set of eligible measure to meet the needs of multiple segments, but design sub-offerings (e.g., kits or special promotions) with specific target segments in mind.</li> <li>Use the popularity of free assessments and lighting upgrades as an entry point for deeper savings measures.</li> <li>Assign a personal concierge to small businesses to guide them through all available offerings and streamline participation.</li> <li>Reduce or eliminate paperwork, where possible.</li> </ul> | <p>7. Explore whether it would be cost-effective to add enhanced incentives to SBES for comprehensive HVAC and weatherization upgrades (i.e., higher incentives compared to the EWfYB Program, but lower than other SBES measures). If DESC does add them, consider integrating them into current SBES processes by including exploration and discussion of HVAC and weatherization upgrade opportunities during the SBES assessment. Refer to the Duke Energy Progress case study as an example.</p> <p>8. Consider adding a business customer version of the EnergyWise Savings Store, including discounted products and free kits that are tailored to specific types of small businesses. Refer to the Entergy case study as an example.</p> <p>9. When AMI data is available for all or most small business customers (anticipated early 2024), explore AMI-enabled programs such as Virtual Commissioning and Business Energy Reports. Both of these designs are no- or low-cost to the customer and do not require on-site visits or paperwork, addressing two well-known participation barriers for small businesses (time and money).</p> |
| <b>Barriers</b>  |  |  |
| What barriers to energy management, generally and participation in DESC programs specifically, do small businesses customers face?                               | <p><b>Awareness:</b> Awareness is perhaps the biggest barrier to participation. Less than half (40%) of the small business survey respondents were aware of DESC’s programs. Several community leaders emphasized this point, commenting that many small businesses would not know where to go if they needed help reducing their energy bill.</p>   | <p>10. Explore whether there is a need to increase outreach staff for SBES. While DESC does some additional marketing, they primarily rely on ICF’s four subcontractors to on-visit and recruit businesses. ICF also has a community ambassador that attends local community and chamber events. Explore whether the</p>   |

| Research Question(s)  | Key Findings  | Recommendations for Future Small Business Program Design and Engagement Strategies   |
|---|---|--|
|   | <p><b>Implementation Resources:</b> DESC staff noted that they have a large pipeline of participants; however, it has been difficult to serve them rapidly based on the number of installation staff available.</p> <p><b>Decision-Making Power:</b> Small businesses are more likely (35%) to rent or lease their building compared to medium/large businesses (7%); and they are more likely to only occupy part of their facility (38% vs. 7%). Both of these factors may limit the authority small businesses have to approve comprehensive energy upgrades. Among small business renters, over a third (38%) of respondents said they had no decision-making authority over their facilities' energy-using equipment.</p>  | <p>one ambassador and other outreach staff provide sufficient coverage across DESC's territory, or whether additional ICF outreach staff or other community partners would help reach underserved regions or segments.</p> <p>11. Consider whether there are opportunities to allow all contractors to provide all SBES measures, regardless of their particularly specialties. Training and increased quality control inspections of projects (i.e., when contractors install measures outside of their specialty) may be necessary to ensure quality installation.</p> <p>12. If DESC decides to add HVAC replacement or weatherization measures, which may require significant building construction, prepare for significant barriers related to getting approval from landlords or property management. Consider conducting primary research with landlords to identify potential solutions. For example, DESC could conduct focus groups with landlords and property management to workshop possible program and incentive designs and marketing messaging strategies.</p> |
| <b>Engagement Strategies</b>  |   |  |
| <p>What possible Marketing Education &amp; Outreach (ME&amp;O) strategies do community leaders suggest would encourage EE/DSM participation among small business customers?</p> <p>What other sources of funding for small businesses could be leveraged by DESC EE programs?</p> | <p><b>Engagement Strategies:</b> The literature review and leader interviews revealed a number of small business engagement best practices and suggestions:</p> <ul style="list-style-type: none"> <li>▪ Categorize the markets to identify and tailor ME&amp;O efforts to specific types of target small businesses.</li> <li>▪ Develop testimonials that highlight the benefits of customers; for example, similar segments, businesses that rent/lease their space, similar types of end-uses.</li> <li>▪ Leverage word-of-mouth marketing within networks of non-profits and other types of CSIs.</li> <li>▪ Establish community partnerships with local chambers and statewide organizations serving small businesses.</li> </ul> <p><b>Funding:</b> Community leaders reported that small businesses will typically look to their local chambers of commerce for support and connections to financial resources. Outside of local resources, small businesses may also seek</p> | <p>13. Use the results of this market characterization to identify high priority subsegments of small business customers that have historically been underserved by SBES and develop ME&amp;O strategies and materials, such as testimonials or strategic partnerships with specific industry associations, that speak directly to these subsegments.</p> <p>14. If DESC identifies non-profit organizations as a key target subsegment, consider establishing a referral program that encourages program participants to share their positive experiences within their network. Also, explore partnership opportunities with the Coastal Community Foundation and Together SC, which are</p>  |

## Summary of Small Business Program Design and Engagement Findings

| Research Question(s)   | Key Findings  | Recommendations for Future Small Business Program Design and Engagement Strategies  |
|--|---|---|
| Are there other strategies or partnerships DESC should consider? | assistance from the South Carolina Small Business Development Center (SCSBDC) or the US Small Business Administration (SBA); both offer various types of support including financial resources such as loans and grants. President Biden's Bipartisan Infrastructure Investment and Jobs Act presents another potential opportunity for additional funding in the near future. DESC would likely not qualify as a recipient for these funds. As such, DESC would need to establish partnerships with community organizations that can qualify (e.g., chambers of commerce, municipal governments, or other non-profits) to leverage this funding. | <p>regional and statewide organizations supporting non-profits.</p> <p>15. Establish ME&amp;O partnerships with local chambers of commerce and the SCSBDC. Considering sharing customizable marketing materials that these organizations can distribute, attending local chamber events, and promoting SBES alongside the various other financial support resources on these organizations' website. Detailed results within this section provides specific partnership opportunities in Charleston, Aiken, and Saluda.</p> |

## 10.1 Program Designs

Through a review of secondary research papers and EM&V reports, the team examined small business programs from approximately 11 utilities across 10 states. The review revealed that the dominant small business program design across the industry is a small business direct install (SBDI)-type model.<sup>15</sup> DESC's Small Business Energy Solutions (SBES) Program is an example of this design, offering a no-cost assessment followed by lighting and refrigeration upgrades, as well as HVAC system improvements (tune-ups, advanced thermostats, duct sealing, and controls), with incentives up to 90% of project costs; up to a maximum cost of \$6,000. Some utilities have expanded upon the SBDI model by adding incentives for more significant upgrades, typically HVAC and/or weatherization upgrades, with higher incentives compared to their standard business programs. Additionally, the team identified a few relatively rare, but innovative program designs: virtual commissioning and a small business online store, including discounted products and free energy efficiency kits. The Business Energy Reports and Virtual Commissioning designs typically leverage advanced metering infrastructure (AMI) data, which DESC will have rolled out to most business customers by early 2024. Table 67 summarizes these designs and case examples of these program designs follow the table.

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<sup>15</sup> Nowak, Seth. 2016. "Big opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs." ACEEE. November 2016.



Table 67. Small Business Program Designs

| Program Design                     | Description  | Count of Utilities Providing Offering |
|------------------------------------|--|---------------------------------------|
| SBDI                               | A free energy assessment and then a follow-up appointment to install of smaller energy savings measures. Lighting and refrigeration upgrades are most common, but some utilities also include smart thermostats, other HVAC controls (e.g., motors), or (in one case) food service equipment. The utility typically covers a large percentage of the project cost for the customer (where information was available online, the programs covered 70% or more).   | 10                                    |
| Enhanced Small Business Incentives | Small business-specific rebates or discounts on comprehensive upgrades. All four utilities included HVAC equipment replacements and/or weatherization upgrades specifically. The “enhanced” incentives are higher than the utilities’ standard business programs, which are available to all businesses but are often cost-prohibitive for small businesses. <sup>16</sup> Utilities will often package this offering within SBDI (i.e., discuss available upgrades during the SBDI assessment) but cover a smaller percentage of the cost compared to other SBDI measures.  | 5                                     |
| Business online store              | Business customer-specific online store with discounts on energy efficiency products. Some online stores also include free kits of energy-savings products. One utility’s online store is specific to small businesses, and the other two stores are available to all business customers.  | 4                                     |
| Virtual commissioning              | Also referred to as “analytics-enabled retro-commissioning,” this program uses AMI data to remotely identify small business customers who may benefit from low- or no-cost energy upgrades or energy management changes. These opportunities commonly include HVAC system modifications and lighting scheduling adjustments. Once the utilities have identified the customers and potential improvements, program staff then contact potential participants to share the results of the analysis, confirm the energy-saving opportunities, and verify facility characteristics. If the customer agrees to participate, the program staff implement the changes and calculate savings using AMI data. The utility may also use this design as a foot in the door, channeling customers into other small business offerings. The analysis service and advising is at no cost to the customer, but some projects may include costs to the customer. | 3                                     |
|                                    |  |                                       |

<sup>16</sup> Funk, K. 2012. “Small Business Energy Efficiency: Roadmap to Program Design.” ACEEE. 2012.



## Small Business Direct Install

Oncor's SBDI Program provides small business customers (commercial customers that use 200 KW or less) with a free, no obligation energy assessment, including an inspection of existing lighting and refrigeration equipment. Oncor's service providers explain and review energy-saving opportunities and work with customers to create a personalized plan, selecting the most appropriate lighting and refrigeration equipment upgrades that best fit the needs for their business. The program provides an incentive directly to the service provider, covering up to 70% of the project's costs. The customer is then responsible for paying the service provider the remaining portion of the cost (as low as 30%) once the project is complete.

### Learn more:

<https://www.oncor.com/takealoadofftexas/pages/small-business>

No evaluation information is available.

## Enhanced Small Business Incentives

Duke Energy Progress (South Carolina)'s Small Business Energy Saver Program provides small business customers (commercial customers with an average annual demand of 180 KW or less) with lighting, refrigeration, and HVAC equipment upgrades. The program includes an SBDI-like offering, providing a free energy assessment and covering up to 80% of the cost for lighting and refrigeration equipment upgrades. However, it also includes incentives for HVAC upgrades up to 20% of the cost.

### Learn more:

<https://www.duke-energy.com/business/products/small-business-energy-saver>

No evaluation information is available for the DEC program, but an evaluation of the AIC Small Business Energy Performance Program is available here:

<https://ilsag.s3.amazonaws.com/AIC-2021-Business-Program-Annual-Impact-Evaluation-Report-FINAL-2022-04-29.pdf>

## Virtual Commissioning

Ameren Illinois Company's (AIC's) Virtual Commissioning offering is an alternative to the AIC's larger retro-commissioning offering. It caters specifically to the time and upfront cost constraints many small businesses experience by eliminating the need for on-site visits or paperwork. Before contacting the customer, the program implementer uses AMI data to identify customers with the potential to save from low- or no-cost energy management changes. Typical changes include optimizing equipment schedules; managing start-up and shutdown schedules; and programming equipment setbacks to reduce unnecessary usage. The implementer provides the customer with a report and recommendations, the customer makes the changes on their own, and then the implementer estimates savings using AMI data.

### Learn more:

<https://amerenillinoisavings.com/vcx/>

Evaluation available here:

<https://ilsag.s3.amazonaws.com/AIC-2021-Business-Program-Annual-Impact-Evaluation-Report-FINAL-2022-04-29.pdf>

An evaluation of similar program from ComEd is available here

<https://ilsag.s3.amazonaws.com/ComEd-VCx-CY2020-Impact-Evaluation-Report-2021-04-26-Final.pdf>

## Business Online Store

Entergy provides an online store and kit of energy-saving products exclusively available to small business customers. The Energy Smart Small Business Store allows customers to receive instant discounts on energy-saving equipment purchases, such as various LED lighting, faucet aerators, smart thermostats, showerheads, and power strips. Additionally, embedded within the online store, Entergy offers three types of Small Business Energy Efficiency Kits:

1. a “restaurant” kit (three standard LEDs, two bathroom aerators, two kitchen aerators, and two LED Exit Sign retrofit bulbs);
2. an “office” kit (two general-standard LEDs, two bathroom aerators, one kitchen aerator, two LED Exit Sign retrofit bulbs, and one Tier 1 advanced power strip); and
3. a “retail” kit (two standard LED bulbs, one bathroom aerator, two LED Exit Sign retrofit bulbs, and two specialty reflector LEDs).

Learn more:

<https://energysmart.store/default/>

<https://www.energysmartnola.info/small-biz-kits/>

No evaluation information is available for the Entergy program, but an evaluation of the AIC’s small business-focused Online Store is available here:

<https://ilsag.s3.amazonaws.com/AIC-2021-Business-Program-Annual-Impact-Evaluation-Report-FINAL-2022-04-29.pdf>

## 10.2 Additional Design Considerations

The literature review revealed a number of other key considerations for small business program design.<sup>17</sup>

- **Design Targeted Program Offerings:** Some utilities offer multiple program types or pathways within their small business offerings that cater to the needs of specific types of businesses or groups of businesses with similar energy-using equipment. This approach can help utilities better meet the unique needs of various business sectors and expand program participation.
- **Use SBDI as an Entry Point:** SBDI-like designs continue to be attractive to small business customers, as they provide a turnkey, convenient design applicable to a variety of customers’ needs. Although lighting historically dominates energy savings from these programs, the assessment and a broader assortment of eligible measures can open up the possibility of deeper savings per project and increase overall energy efficiency savings potential.

<sup>17</sup> Nowak, Seth. 2016. “Big opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs.” ACEEE. November 2016.

- **Provide a Wide Set of Eligible Measures:** Certain industry segments' energy usage can be heavily weighted on specific end uses that are not common across all business customers. By developing and delivering a greater selection of eligible equipment, including consideration of gas end uses, utility programs can expand program participation by meeting a wider set of customer needs.
- **Make Participation Simple and Convenient:** While it is a key to success for most energy efficiency programs, making participation as easy as possible for the customer is especially important for small business owners, who likely work long hours and lack spare time while balancing multiple priorities to keep their business afloat. The team identified two potential strategies, as examples:
  - **Assign a personal concierge.** Several community leaders we spoke with noted lack of time and awareness of energy-saving opportunities as primary barriers to program participation for small businesses, suggesting that DESC may have stronger participation if they are able to simplify the overall process for the customer and present information using a more clear and direct method. A strategy some utilities have used to simplify the participation process is providing small businesses with a dedicated account or program representative, similar to the support utilities typically provide larger business customers. The representative walks customers through their energy-saving options and guides them through the participation process. As such, the representative should be part of the program team or otherwise very well-versed and knowledgeable about all utility program offerings available to the customer. This approach has been shown to result in deeper program savings, although it can result in increased administrative costs as a tradeoff.

*If you could make it easy for them, I think they're going to do it, but are they going to take time away from making a sale of whatever to doing an energy efficiency project about it? I don't think so, no."*

*(Saluda leader)*

*"Reach out, you've got to figure out a way of getting these people to pay attention to you... You know what happens in the communication field [like] AT&T, Spectrum, they're sending out emails and calling all the time. Does Dominion do any of that?...We have to understand that those sales people are calling, they're trying to make money, right? They probably get a commission...Maybe Dominion ought to look at a model like that"*

*(South Carolina Small Business Chamber of Commerce representative)*

- **Reduce or eliminate paperwork.** Community leaders also mentioned the need for streamlining the application process to simplify the customer experience to the Study Team. Time consuming paperwork was noted by leaders as a primary factor likely to deter small business from participating in a program, due to the busyness of this customer segment.

*"...if we could just sit down with real people, and not have to fill out forms...most small businesses are trying to balance the business, the time that that takes, the family, the time that that takes...they don't have time for a lot of other things.... It's almost like it needs to be someone walking in the door and handling that part for them."*

*(Aiken leader)*

## 10.3 Other Funding Sources

The team explored what other funding sources exist for small businesses that DESC could potentially leverage. Community leaders reported that small businesses will typically look to their local chambers of commerce for support and connections to financial resources. Outside of local resources, small businesses may also seek

assistance from the South Carolina Small Business Development Centers (SCSBDC) at the state-level,<sup>18</sup> or the US Small Business Administration (SBA);<sup>19</sup> both offer various types of support including financial resources such as loans and grants.

President Biden's Bipartisan Infrastructure Investment and Jobs Act presents another potential opportunity for additional funding in the near future.<sup>20</sup> The recently passed bill includes many awards targeted at energy efficiency and energy-related pathways, including the following:

- \$50,000,000 (2022–2026 period): Grants to provide nonprofit buildings with energy efficiency materials
- \$40,000,000 (2022–2026 period): Grants for eligible states, with the purpose of training personnel to conduct energy audits or surveys of commercial and residential buildings
- \$250,000,000 (2022): Revolving loan fund capitalization grant program within the State Energy Program with the purpose of conducting commercial energy audits, residential energy audits, or energy upgrades or retrofits
- \$550,000,000 (2022): Energy Efficiency and Conservation Block Grant (CBG) Program with purpose of funding programs that finance energy efficiency and other clean energy capital investments, projects, loan programs and performance contracting programs

Although it is unclear how exactly these dollars will be distributed across various entities at this time, these funds present possible alternate funding opportunities for small businesses and CSIs. DESC would likely not qualify as a recipient for these funds; however, DESC could potentially leverage this funding through partnerships with community organizations that can qualify (e.g., chambers of commerce, municipal governments, or other nonprofits).

<sup>18</sup> <https://www.scsbdc.com/links-and-resources>. Last Accessed: May 2, 2022.

<sup>19</sup> <https://www.sba.gov/funding-programs>. Last Accessed: May 2, 2022.

<sup>20</sup> "Bipartisan Infrastructure Investment and Jobs Act Summary." 2021.

<https://www.cantwell.senate.gov/imo/media/doc/Infrastructure%20Investment%20and%20Jobs%20Act%20-%20Section%20by%20Section%20Summary.pdf>.

## 10.4 Engagement Strategies

The literature review and interviews with community leaders revealed a number of best practices for small business engagement strategies.

### Categorize the Market and Target ME&O Efforts

As described in Section 10.2, some utilities have designed small business programs with a broad array of measures, allowing them to target specific subsegments with customized approaches.<sup>21</sup> This concept applies to marketing approaches as well. By subsegmenting the market, utilities can customize marketing materials and channels with particular targets in mind; and ultimately increase the effectiveness of ME&O by making it personalized and relevant to customers.

### Use Testimonials of Similar Customers

Community leaders emphasized the importance of demonstrating program success upfront when conducting outreach to small business customers. Many noted that without a case study example, outreach efforts are unlikely to make it through all the “noise” small businesses are consistently dealing with on a daily basis. When taking this approach, a key to success is ensuring the success stories are relatable to the target customer. For example, when targeting a small business customer who has an average annual usage of 100 KW and leases their facility space, it would be ideal to share a story where the participant was also a renter with a similar annual usage, as this will improve the credibility of the potential energy and monetary benefits the customer can expect to see as a result of participating in the program. With a significant proportion of small businesses leasing their facility’s space (36% rent or lease, according to the customer survey), it is critically important for utility programs to exemplify renter success stories to demonstrate how program participation under that structure can be successful.

### Highlight Program Benefits

In addition to success stories, community leaders also highlighted how providing specific, upfront savings potential for the customer’s own facility would strongly improve the attractiveness of the program. One leader

#### ACKNOWLEDGING HARDSHIP

One community leader we spoke with recommended acknowledging challenges small businesses are facing when conducting program outreach. The leader highlighted how the last few years have both presented many new challenges and exacerbated existing ones (e.g., supply chain issues and/or delays, high material costs, staffing challenges, business closures, etc.), particularly for small businesses. Showing small businesses empathy regarding these hardships can not only help kickstart a positive relationship, but also presents a good opportunity to demonstrate how program participation, and the resulting energy bill savings, may be able to help relieve some of these pressures.

*“I think the clarity in the message would have to be, ‘Hey, we get what you’re going through. You’re working to keep your employees; you’re working to maintain your customers those you’re serving. What if we could generate you an extra a \$1,000 or \$1,500 or \$2,000 of savings a month so you could take care of those things?’ It almost has to be like a quid pro quo because otherwise they’ve got so many other things on their mind.”*

*(Charleston leader)*

<sup>21</sup> Nowak, Seth. 2016. “Big opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs.” ACEEE. November, 2016.

we spoke with described how impacts from recent world events, including COVID-19, have exacerbated the day-to-day issues small businesses face; making it even more difficult to catch the attention of small business owners. Multiple leaders noted that, from their perspective, the most promising way to grab small businesses' attention is to provide them with specific "numbers" (i.e., estimated energy or costs savings for their facility) upfront when conducting outreach.

While for many, energy and monetary savings potential are of highest importance when considering participating in an energy efficiency program, a lot of small businesses owners do not own their facilities and therefore may not be motivated to pay for energy efficiency upgrades, especially in cases where the building owner pays the energy bills. For this group, demonstrating other benefits that will result from program participation, such as thermal comfort, air quality, and lighting aesthetics, may be better motivators for participation.

### Leverage CSI Networks

Many community leaders we interviewed mentioned the strong network among CSIs, and how they pride themselves on working together to serve their constituents in every way possible. Leaders emphasized how various CSIs lean on one another to make this happen, by regularly connecting with other local agencies to gain access to services they may not provide, but that their constituents need. Utilities can leverage the frequent coordination and communication across these networks, and the overarching spirit of helping one another be successful, to spread the word on positive experiences CSIs have had with their programs.

## 10.5 Community Partnerships

The literature review revealed many reasons why establishing community partnerships may be beneficial for utilities in supporting the success of a small business program. Community partnerships enable utilities to become more engaged in the communities they serve and increase the awareness and credibility of program messaging; emphasizing the importance of selecting organizations viewed as trustworthy by local businesses and institutions.<sup>22</sup> Utilities establish these collaborative partnerships most commonly with local organizations, most of which have grounded networks with small businesses, such as chambers of commerce, downtown business associations, local government, and nonprofits.<sup>23</sup> Other organizations utilities frequently partner with are foundations, trusts and finance agencies that may offering financial lending or other sources of funding to assist program participants in covering any upfront costs.<sup>24</sup>

Community leaders we spoke with were aligned in terms of the best strategy: partner with local chambers of commerce. Leaders the team interviewed felt that chambers of commerce are trusted, supportive and well-connected organizations for small businesses in their communities. Chamber leaders from each community were quick to express interest in assisting DESC with their outreach efforts, for instance, by promoting DESC staff attendance at chamber events, or providing opportunities for outreach through virtual initiatives. For each community, at least one specific chamber event or initiative was noted by a community leader as an

<sup>22</sup> Dreihobl, Ariel, and Kate Tanabe. 2019. "Extending the Benefits of Nonresidential Energy Efficiency to Low income Communities." ACEEE. November 2019.

<sup>23</sup> Nowak, Seth. 2016. "Big opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs." ACEEE. November 2016.



opportunity for DESC to become involved, build relationships with these community members, and spread awareness of program offerings:

- The Charleston Metro Chamber of Commerce's Doing Business Better program is geared specifically toward small business customers. The program is virtually delivered through the chamber's website and based upon businesses sharing success stories with other business members to spread the word about demonstratable successes. Opportunities for DESC involvement in the program were described as pairing a small business program success story with a short video clip of DESC staff providing key program details such as the general participation process, eligible measures, and upfront cost figures and savings potential. The community leader suggested this could be done for multiple segments of small businesses as well, to make each video more relatable for various customer groups. Once the videos are created, they would be shareable on social media sites such as LinkedIn, Instagram, Twitter, etc., to gain additional exposure.
- The Aiken Chamber of Commerce holds a breakfast once a month for its members, where about 150 individuals gather each event to network with other local organizations. The community leader indicated these events see a positive turnout and the majority of attendees are small business owners and managers.
- Both the Saluda County Chamber of Commerce and the Town of Saluda hold regular local events and the community leader stated they would highly recommend DESC become more involved with these events. The leader we spoke with about the events suggested local festivals were likely the best opportunity for DESC to spread awareness about program offerings, as these events typically have the largest attendance.

When considering partnership opportunities, one community leader did provide two recommendations that may be helpful with outreach efforts targeting nonprofits specifically:

- **The Coastal Community Foundation** serves nine counties across the Lowcountry region of the South Carolina and is the largest grant-making organization in the state.<sup>25</sup>
- **Together SC**, a statewide membership organization, aims to empower nonprofits across South Carolina to support the mission of establishing equitable communities. The organization is known for their advocacy work, providing technical assistance, staffing guidance and support, and funding assistance, among many other types of support.<sup>26</sup>

Although chambers of commerce were unanimously mentioned as the best partnership opportunity to support connecting with small businesses, one leader did note that this may not be the case for all business owners, particularly African American business owners. This community leader shared concerns they have heard directly from business owners, suggesting that some African Americans don't receive the level of inclusion they hope for from their chamber of commerce, and therefore turn instead to a historically trusted institution in the African American community, their local church:

*"I know several [African American] individuals who when they started their business, they went to the chamber to try to find the support... while they were welcome to be a part of the chamber, there was not a culture that made them feel welcomed. They did not feel comfortable. And for the African American community, in particular, that is something that is most important...I think when it comes down to support [in the African American community] the most important institution, whether you go to church or not, is the church.... If they need support for their business or for their organization, the number one place that they're going to probably turn to is a church in that community that is active in the community."*  
(Aiken leader)

<sup>25</sup> <https://coastalcommunityfoundation.org/>. Last Accessed: May 2.2022.

<sup>26</sup> <https://www.togethersc.org/>. Last Accessed: May 2.2022.

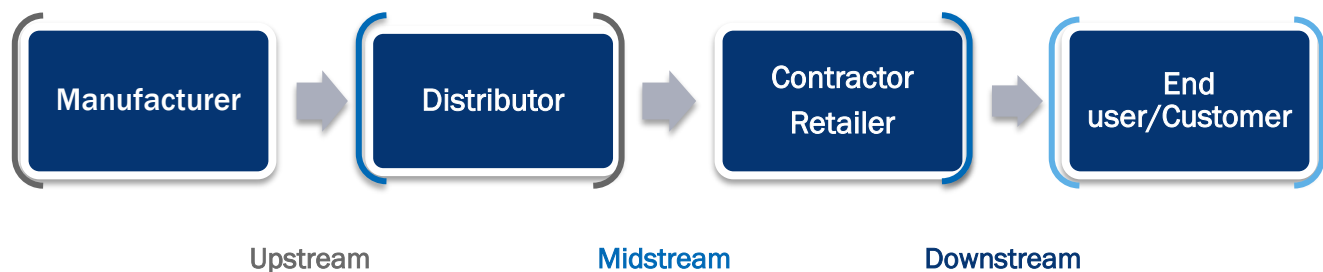


## 11. Midstream and Upstream Model Potential

Energy efficiency programs can be classified as downstream, midstream, and upstream market interventions. Downstream programs target the customer with incentives directly, while midstream and upstream programs target actors earlier in the supply chain. Upstream and midstream program efforts generally incentivize distributors to stock high efficiency equipment and manufacturers to develop high efficiency products. Midstream and upstream programs have the potential to achieve greater savings than traditional downstream programs because they intervene higher up in the supply chain, which generally enables these programs to reach a larger share of the market than traditional programs (Figure 12).

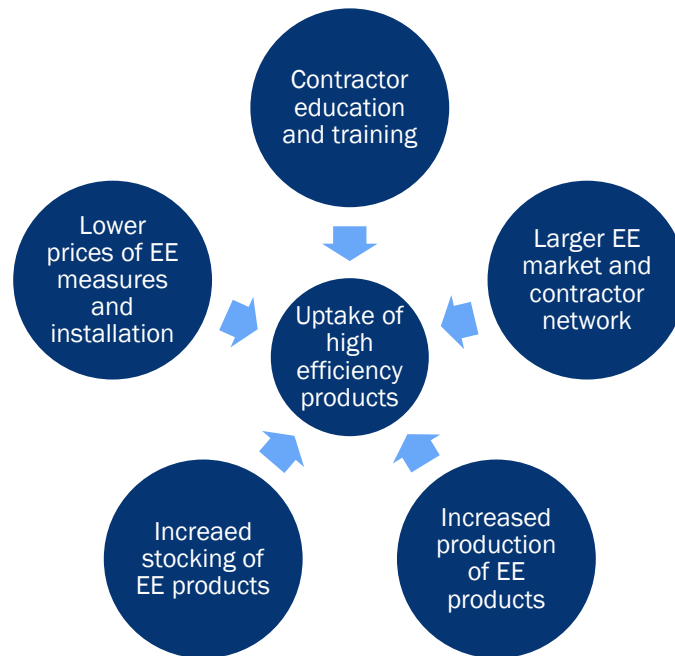
The definitions of midstream and upstream vary across programs. This variation in terminology can likely be explained by the evolution of the use of these terms in the industry as the term “midstream” has become more nuanced over time and is commonly used to refer to programs that incentivize distributors or sometimes contractors/retailers directly, while upstream programs can refer to incentivizing both distributors and manufacturers. This report refers to programs that target distributors as midstream programs, as this is congruent with the current industry definition of midstream.

Figure 12. High Efficiency Market with Midstream/Upstream Intervention



The Study Team compiled a summary of the known performance to date of midstream programs throughout the country. The information provided in this chapter is based on a literature review of over a dozen reports related to commercial and/or industrial midstream programs. Figure 13 below displays the common behavior changes implemented by target actors (mostly focused on distributors and manufacturers) after program implementation is put into place. Incentives, discounts, and rebates are the main triggers that lead these target actors to execute these activities, thus transforming the energy equipment market and feeding into the ultimate goal of fostering the uptake of EE measures, as well as producing energy savings.

Figure 13. Post-Incentive Activities of Target Actors



The information provided in this chapter is based on a literature review of over a dozen reports related to commercial and/or industrial midstream programs (Table 68).

Table 68. Commercial Studies Included in Literature Review

| Author   | Title  | Sponsor   | Year |
|--|--|---|------|
| NMR Group  | Upstream HVAC/Water Heating Process Evaluation   | The Electric and Gas Program Administrators of Massachusetts (Massachusetts Program Administrators [MPA]) | 2021 |
| DNV  | Impact Evaluation of PY2019 Massachusetts C&I Upstream Lighting Initiative   | MPA and Energy Efficiency Advisory Council (EEAC)   | 2021 |
| Demand Side Analytics, Apex Analytics  | Retail and Distributor Lighting Products Impact Evaluation   | Efficiency Maine  | 2021 |
| Cadmus   | Report to Verify Efficiency Vermont 2019 Savings Claim   | Vermont Department of Public Service  | 2020 |
| NMR Group  | The Great Migration: Moving Energy Efficiency Programs to Midstream  | NMR Group   | 2019 |
| EMI  | Xcel Energy Colorado Cooling Efficiency Product 2017 Evaluation  | Xcel  | 2017 |
| Argonne National Lab   | Commercial Midstream Energy Efficiency Incentive Programs: Guidelines for Future Program Design, Evaluation and Implementation | US Department of Energy   | 2017 |
| DNV GL   | Impact Evaluation of 2015 Upstream HVAC Programs   | California Public Utilities Commission  | 2017 |
| DNV GL   | Net-to-Gross Evaluation of 2013–14 Upstream HVAC Programs  | California Public Utilities Commission  | 2017 |
| DNV GL   | Upstream HVAC Initiative Process Evaluation  | Massachusetts Program Administrators and Energy Efficiency Advisory Council                               | 2017 |
| Navigant   | ComEd Midstream Incentives Program Evaluation Report   | ComEd   | 2016 |
| Massachusetts Energy Efficiency Advisory Council (MEEAC)   | C&I Innovation: A Review of Upstream Offerings Memo  | MEEAC   | 2015 |
| NMR Group, Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Southern California Gas Company (SoCalGas) and Prah and Associates | Effective Practices for the Evaluation of Market Transformation Efforts  | NMR Group, PG&E, SCE, SoCalGas, and Prah and Associates   | 2015 |
| Geller and Quaid   | Upstream Utility Incentive Programs: Experience and Lessons Learned  | Southwest Energy Efficiency Project (SWEET)   | 2014 |

## 11.1 Program Model Performance to Date

Program Administrators (PAs) across the country have been deploying midstream programs to deliver a variety of different measures to customers for over 25 years. Table 69 provides some examples of the different commercial measure types that PAs deliver through commercial midstream program models.

Table 69. Summary of Midstream Measure Offerings

| Commercial Measure Type       | Program Administrators That Deliver the Measure Type through a Midstream Program Model |
|-------------------------------|--|
| <b>Commercial</b>             |  |
| Lighting (CFLs and LEDs)      | Many Program Administrators have executed lighting programs                            |
| HVAC equipment                | PG&E, Mass Save, Xcel, Energize Connecticut, Puget Sound Energy                        |
| Water heaters                 | PG&E, Energize Connecticut, CPUC   |
| Electronics (e.g., computers) | NEEA   |
| Chillers                      | PG&E, Xcel   |
| Circulating pumps             | Efficiency Vermont, Energize Connecticut   |
| Food service equipment        | PG&E   |

Source: Quaid and Gellar, 2014

The Study Team examined evaluation results from several of the most current midstream programs included in the review to further understand the measure offerings delivered through these programs and the adoption of each measure type (Table 70). Evaluations include multiple programs that have delivered HVAC and lighting measures to customers through midstream models. Results available to the public to-date show that midstream models tend to have large participation numbers and low operating costs, however there is lack of information in the marketplace around free-ridership especially as it relates to HVAC measures. Many Program Administrators are currently in the midst of conducting free-ridership for these programs and we expect that information to be available to the marketplace in 2023. Additionally, it is vital to be cognizant of the market shifts in response to Covid-19 and current supply chain issues when analyzing historic midstream initiatives to guide future potential programs.

Table 70. Midstream Program Measure Offerings and Performance by PAs

| Program Name  | Measures Offered   | Measure Adoption Results   |
|---|--|--|
| AIC Instant Incentives Offering   | Standard, specialty and linear LEDs  | In 2018, Instant Incentives savings represented approximately 15% of savings from the Business Program and 9% of total portfolio savings. In addition to lighting, AIC has considered adding notched V-belts to this offering.   |
| Massachusetts and Rhode Island Commercial and Industrial Instant Incentives     | Select LED lamps, LED stairwell fixtures and sensors, LED downlights, linear replacement lamps   | For PY2019, the program achieved an average 86% realization rate and 84% in service rate. The delta watt realization rate for most lamps was above 100% with the exception of high/low bay LEDs at 57%.  |
| Efficiency Maine  | Specialty LED long life/short life, LED specialty bulb reflector long/short life, etc.   | For PY2020, the program achieved an NTGR of 49% (including spillover) and 3,915 nonresidential enrollments and exceeding the cost-benefit threshold.   |
| CPUC Upstream HVAC programs (includes programs offered by PG&E, SCE, and SDG&E) | Unitary heat pumps   | All programs offered unitary heat pumps. As such, performance results only different by unit size. This impact evaluation of the 2015 Upstream HVAC programs revealed lower than expected savings for the smallest size units (under 4.5-ton) and good realization rates for 5.5–20-ton units. The primary driver of the realization rates was that, on average, the full-load efficiencies of the installed equipment were lower than claimed estimates assumed efficiency levels in some cases.  |
| Efficiency Vermont Upstream C&I/Multifamily Program                             | Smartlight (LEDs), cold climate heat pumps, heat pump water heaters, brushless permanent magnet motor circulator pumps, condensing units, and others   | The Upstream C&I/Multifamily Program had realization rates of 100% for both the upstream Smartlight (LEDs) and Upstream HVAC components of the program. The savings reported here accounted for 19% of the total portfolio's energy savings.   |
| Xcel Colorado Cooling Efficiency Product  | Packaged and split AC units, water source heat pumps, air-cooled chillers, and PTAC/PTHP units   | Trends in the midstream data reveal fluctuations in the types of measures driving savings each quarter. Overall, savings are dominated by direct expansion air conditioning units (50% of the total KWH savings) and air-cooled chillers (26% of total KWH savings) (EMI, 2018).   |
| Massachusetts Program Administrators Upstream HVAC                              | Unitary and split AC systems (air cooled, including all types of heating), unitary AC systems (evaporatively cooled, including all types of heating), unitary AC systems (water cooled, including all types of heating), unitary heat pump systems (air cooled), unitary heat pump systems (water source), ground water – water source heat pump equipment (open loop), ground loop – water source heat pump equipment (closed loop), energy savings control and fan motor options | <p>The evaluation reported the Initiative offers HVAC technologies that PA program managers and implementers believe may not fit the purpose or model of the initiative, (a full rationale for these recommendations is available):</p> <ul style="list-style-type: none"> <li>▪ ASHPs</li> <li>▪ Water source heat pump</li> <li>▪ Ground source heat-pumps, open and closed loop systems</li> <li>▪ Rooftop units</li> </ul> <p>PA program managers and implementers recommended adding several technologies to the Initiative:</p> <ul style="list-style-type: none"> <li>▪ VRF, VRV</li> <li>▪ Air-cooled chillers</li> <li>▪ EMS</li> </ul> |

| Program Name                       | Measures Offered   | Measure Adoption Results   |
|------------------------------------|--|--|
| ComEd Midstream Incentives Program | LED lamps, LED fixtures, LED exit signs, linear fluorescents, and battery chargers | LED lamps made up approximately 84% of the total program verified net electric savings (211,210 MWH) |

Based on the literature review, lighting and HVAC equipment have been the primary commercial categories for upstream and midstream products. Additionally, Massachusetts shows potential for new lighting savings through lighting control technologies in the commercial and industrial spaces along with other controls (EMS controls). Heat pump water heaters and HVAC heat pumps are also technologies that have been offered in C&I programs.

Evaluations of Xcel and PG&E's programs included comparisons of midstream and downstream program efforts. Xcel offered midstream and downstream cooling efficiency programs simultaneously and each delivery model featured different types of HVAC equipment. Evaluation results show that both programs achieved similar electric savings, but the midstream delivery model served considerably more premises than the downstream model (420 vs. 57) (EMI 2018). PG&E experienced a 900% increase in market impact when they switched from a downstream model to a midstream model for delivering unitary packaged HVAC equipment to customers (Geller and Quaid 2014).<sup>27</sup> Following the success of this program, PG&E began offering additional measures through the midstream model, including VRF systems, water-cooled chillers, ductless mini-split systems, EE water heaters and food service equipment. PG&E realized similar increases in the market impact of these technologies when they began offering them through a midstream model (Geller and Quaid 2014).

It is important to recognize there are limitations to using past evaluation results to inform the selection of new midstream program measure offerings. First, evaluations have focused on a wide variety of impacts and measurements, not offering consistency in findings and results that allow for easy comparison. The evaluation results currently available cover program results through 2021 and the market for efficient products is constantly changing as the market transforms with new innovations and adoption patterns among customers. The following measures may be appropriate for a midstream program model given current market conditions (Merson et al. 2018):

- Commercial HVAC
  - Heat pumps, HPWHs and other heat pump-related technologies
  - VRF and VRV
  - Electronically commutated motors (ECMs)
  - Advanced thermostats
  - Fans, pumps and compressors
  - VFDs
- Commercial Lighting
  - Control-related technologies (including lighting controls)

Notably heat pumps show strong market potential across the US and this measure has proven to be a good fit for the midstream program model in some other jurisdictions (Merson et al., 2018) such as Massachusetts (NMR, 2021) and California (Opinion Dynamics, 2021). Lighting controls may be an additional area of

<sup>27</sup> PG&E measures market impact in tons of HVAC equipment

opportunity as PAs have already helped to transform the market for other lighting measures including LEDs through multiple program delivery models. Equipment found in food service, including refrigeration equipment also have strong potential. Again, it should be stated that market shifts in response to Covid-19 and current supply chain issues should be accounted for when analyzing historic midstream initiatives to guide future potential programs.

## 11.2 Midstream Market Receptivity to Program Model

The Study Team interviewed distributors in DESC service territory, looking to understand awareness of midstream programs offered through utilities, involvement in this type of program delivery model, and receptivity to participating in a DESC-sponsored midstream program. Interviewees included both lighting and HVAC equipment distributors serving a combination of residential and nonresidential buildings. A key takeaway from these interviews is that HVAC distributors were aware of midstream programs and thought favorably of them in general. While HVAC distributors did identify a number of important considerations for a program, they responded positively to the possibility of midstream program design. Lighting distributors expressed mixed opinions about the opportunity for lighting in the commercial space; some lighting distributors indicated that the entire market for lighting had completely transformed to LED, there was no longer any customer demand for other options while others identified that there was still opportunity in the retrofit market for specialty lighting, lighting controls and occupancy sensors.

The Study Team also held a workshop in 2019 with seven HVAC and plumbing contractors who serve DESC customers and discussed the same topics. Five of the HVAC contractors served commercial facilities, mostly with a focus on small businesses. The goal of the small business discussion in 2019 was to gain feedback on non-lighting measure adoption for small businesses, specifically HVAC tune-ups. Although contractors felt that some of the expanded incentives for new and existing programs were sufficient to move the needle towards increased EE equipment sales, they raised concerns with incentives that were not high enough to cover the marginal cost of labor to implement, specifically with regards to HVAC tune-ups and duct sealing/replacement. Given the various challenges associated with small business HVAC tune-ups (e.g., the unit's location is often on a roof or another potentially dangerous location, the technician has to perform the tune-up outside of normal business hours, and commercial systems may require more complex and/or labor-intensive tune-ups), the estimated cost ranged between \$400 and \$800. All contractors agreed that under a midstream program delivery channel, equipment distributors would likely not pass rebates along to customers or contractors, unless they were forced to do so.

### 11.2.1 Disposition and Characterization

The Study Team began with a list of forty-three distributors in the lighting, HVAC and food service distribution spaces, the team completed nine interviews representing eight distributors. Of the remaining thirty-two contacts, fifteen did not respond to attempts to contact, eight refused to be interviewed, and nine were deemed invalid for various reasons (duplicate, not available, or not otherwise eligible). Six of the eight distributors serve both residential and nonresidential customers and two only serve nonresidential (see Table 71). These distributors serve customers throughout DESC territory, with several distributors covering all of the US (see Table 72).



Table 71. Completed Interview Type by Equipment and Sector

| Equipment              | Residential Only | Nonresidential Only | Both Res & Non-Res |
|------------------------|------------------|---------------------|--------------------|
| Lighting or “electric” | 0                | 2                   | 4                  |
| HVAC                   | 0                | 0                   | 2                  |
| Food service           | 0                | 0                   | 0                  |

Table 72. Individual Responding Distributor Sector, Equipment, and Geographic Area

| Distributor    | Sector | Equipment | Geographic Area   |
|----------------|--------|-----------|---|
| 1 <sup>a</sup> | Both   | Electric  | Specific to interview, 25–30 counties surrounding Augusta, GA, including 10 in SC around Columbia |
| 2              | Both   | HVAC      | Tri-County surrounding Charleston   |
| 3              | Both   | Electric  | SC Coast down to Savannah, GA   |
| 4              | C&I    | Electric  | All US  |
| 5              | Both   | HVAC      | Lower third of SC   |
| 6*             | C&I    | Electric  | All of SC   |
| 7              | Both   | Electric  | All of Southeast, focus surrounding Savannah  |
| 8              | Both   | Electric  | All SC, focus on Greater Columbia   |

<sup>a</sup>. Interviewees specifically identified that company is nationwide but referred to just their own territory for interview. Other organization may also have larger footprint, but interviewee referred to own area of responsibility.

The workshop in 2019 with seven contractors ran similar to a focus group, with a moderator and a set agenda of topics for discussion. Seven contractors attended the first workshop, which included five small business HVAC contractors. All attendees of the contractor workshop serviced the Columbia area, some service Aiken, and one services Charleston. The discussion topics covered by the residential contractor workshop include: Water Heating, HVAC Equipment, Duct Repair & Replacement, Tune-Ups, Small Business Non-Lighting Measures, Midstream Delivery Channel Program Concept, and Miscellaneous Items.

### 11.2.2 Program Awareness and Interest

Of the nine professionals interviewed, almost all (8 of 9) were aware of midstream programs. They had heard of the concept before or could identify that the incentive goes to the retailer, distributor, or manufacturer instead of directly to a customer. All respondents were interested in the concept and indicated strong interest in learning more about any specific program that may be offered in their territories by DESC. Overall, the five HVAC contractors in the 2019 contractor workshop were aware and knowledgeable of DESC’s current program offerings.

### 11.2.3 Equipment Opportunities

Opportunities identified by distributors generally matched those identified through literature review of commercial programs. Opportunities here are divided between those identified by lighting and HVAC distributors.

#### Lighting Distributors

Lighting distributors expressed mixed opinions about the opportunity for lighting in the commercial space, as they did with the residential sector. Some lighting distributors indicated that the entire market for lighting had



completely transformed to LED, there was no longer any customer demand for other options. Other lighting distributors identified that there was still a market—upon further investigation, the team identified that the distinction exists between supplying existing fixtures and new construction. According to interviewed distributors, new construction is not looking for anything other than LED fixtures, outside of specialty lighting products. Conversely, respondents indicated that there may still be opportunity in the market for retrofitting existing lighting. Additionally, several distributors did identify lighting controls as an area where they are seeing more growth and interest. It was clarified by one distributor that they see the market turning toward occupancy sensors, and not more fully automated or centrally controlled systems, indicating that there may still exist opportunity with advanced lighting controls.

## HVAC Distributors

HVAC distributors identified high efficiency equipment as generally consisting of units rated 16 SEER or higher, with as much as 40% of sales falling into this category. The cost difference between a generic 14 SEER and a 16 SEER, which respondents estimated at \$1,500–\$2,000. One distributor did note that while price is a consideration, so is the attitude of contractors, stating “...because it's got a lot of bells and whistles in it, they're scared of it, especially your older contractors.” This point is supported within numerous studies in the literature examined, indicating that any program offered must have a strong engagement element regardless of incentives.

One distributor identified advanced thermostats as a necessary element for high efficiency (16+ SEER) equipment. This point is supported by the inclusion of controls in various efficiency programs—both C&I and residential.

Both distributors interviewed expressed moderate to strong interest in a midstream program for efficient HVAC equipment, but with a common set of reservations. Interviewees expressed if the program required too much of them, that would be a barrier to their participation. Examples offered included complicated incentive rules with lots of variation from product to product, excessive application paperwork, rebate delays and potential rebate refusals. In summary, any program that collaborates with distributors should be made to be as effortless as possible for distributors.

## HVAC Contractors

We conducted contractor workshops in 2019 with seven HVAC and plumbing contractors who serve DESC customers and discussed the same topics. Five of the HVAC contractors served commercial facilities, mostly with a focus on small businesses. The goal of the small business discussion in 2019 was to gain feedback on non-lighting measure adoption for small businesses, specifically HVAC tune-ups. Although contractors felt that some of the expanded incentives for new and existing programs were sufficient to move the needle towards increased EE equipment sales, they raised concerns with incentives that were not high enough to cover the marginal cost of labor to implement, specifically with regards to HVAC tune-ups and duct sealing/replacement. Given the various challenges associated with small business HVAC tune-ups (e.g., the unit's location is often on a roof or another potentially dangerous location, the technician has to perform the tune-up outside of normal business hours, and commercial systems may require more complex and/or labor-intensive tune-ups), the estimated cost ranged between \$400 and \$800.

In addition, we solicited feedback from all contractors for a proposed midstream delivery program. All contractors expressed concerns with such a program, suggesting that giving the rebate directly to equipment distributors would simply encourage distributors to artificially raise the equipment price and keep the discount for themselves. One contractor, who had previously worked as an equipment distributor, argued that the profit margins were so narrow that contractors and the end-users would never see a dime of the rebate if it went to

the distributors. All other contractors agreed. This concern is the primary barrier with contractors participation in a midstream program model.

#### 11.2.4 Barriers

Distributors identified three key and related considerations for midstream program: customer engagement, distributor engagement, and program clarity and simplicity.

**Customer and Contractor Engagement:** It is important customers and contractors are aware there is a program that provides savings, even if incentives are being dispersed at the distributor level. One HVAC distributor noted that is especially important for new construction where contractors and developers may be making bulk decisions, based largely on price. As cited above, contractors (who are customers for distributors) may have misunderstandings about efficient products that will need to be addressed, along with program incentives to influence product availability and cost.

**Distributor Engagement:** Distributors felt it was important that they be engaged early in the process of designing a program to collaborate with them. This was identified as important to ensure that processes would work for them, and not serve as a barrier. Examples given included customer verification and incentive-level programs being too complex in some jurisdictions, or incentive payments being subject to extensive delay or at risk because of program checks and procedures.

**Clarity and Simplicity:** In addition to being engaged in the processes of developing program mechanisms and operational details, distributors also stressed that it was important that any program be clear and simple. Incentives should not have complex schemes or require calculations, for example. One distributor cited a program where only white-listed products were permitted, omitting by default highly similar products or new products of potentially greater efficiency that were simply not yet included on the list. Distributors expressed interest in a program that would increase sales, but not necessarily at the cost of significantly greater administrative burden.

## 12. Winter Peak Demand Response Programs

This section explores the opportunities and barriers for managing winter peaking demand response amongst DESC nonresidential customers.

### 12.1 Why Winter Demand is Important to Southeast Utilities

As prolonged cold snaps and unexpected bouts of cold weather become more common, states that were previously summer peaking have a higher chance of transitioning to winter or dual peaking. While they are typically shorter in duration than summer peaks, consecutive hours of cold over multiple days challenges the grid not only by increased demand for electricity, but also by potentially compromising essential power generation systems aimed at meeting hiked demand. Winter peaks will also occur more frequently as electrification continues to grow, specifically the additional load added by the uptake of EVs and electric heating systems.

Daily winter peaks are also of concern as well. Although the residential sector contributes the most to winter load shape spikes in the early morning and late evening, the commercial sector drives a noticeable increase in demand.<sup>28</sup> Once the workday begins and people transition from home to work, commercial and industrial (C&I) HVAC and lighting systems power on and a mid-morning bump in demand occurs.

According to a report released by the Southern Alliance for Clean Energy, the Southeast region as a whole is dual peaking. However, DESC is categorized as dual peaking/transitional, signaling a potential shift to becoming a winter peaking utility; it would join eight other SE utilities classified as such.<sup>29</sup> This is also supported by ACEEE's mid-century model, which, even in a low electrification scenario, shows an increase in winter-peaking hours for the Southeast by 20%.

The changing landscape of how C&I buildings are heated and the timeframes in which it occurs is an evolving issue for utilities. As demand for electricity increases, unless the proper infrastructure and demand response protocols are in place to mitigate peak demand, the reliability of the grid comes into question. As more utilities across the country transition to winter-peaking and/or experience changing winter load shapes, they must be prepared to adapt to these changes.

### 12.2 Literature Review Demand Response

Demand response can look different depending on load type and the commercial customer type or size being served. The following subsections explore various winter load types and demand response measures, as well

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<sup>28</sup> Specian, Mike, et al.

<sup>29</sup> Wilson, John D., and Maggie Shober.

as pertinent winter demand response programs in the United States that address some of these topics. Table 73 presents the sources referenced in this demand response deep dive.

Table 73. Winter Demand Response Sources

| Author(s)                           | Source title   | Sponsor                               | Year |
|-------------------------------------|--|---------------------------------------|------|
| Specian, Mike, et al.               | Demand-Side Solutions to Winter Peaks and Constraints                        | ACEEE                                 | 2021 |
| Wilson, John D., and Maggie Shober. | Seasonal Electric Demand in the Southeastern United States                   | Southern Alliance for Clean Energy    | 2020 |
| Dunsky Energy Consulting            | Duke Energy Winter Peak Demand Reduction Potential Assessment                | Duke Energy                           | 2020 |
| Nandy, Paulomi, et al.              | Demand Response in Industrial Facilities                                     | U.S. Department of Energy             | 2022 |
| Alstone, Peter, et al.              | 2025 California Demand Response Potential Study                              | Lawrence Berkeley National Laboratory | 2017 |
| Dominion Energy South Carolina      | Modified 2020 Integrated Resource Plan                                       | Dominion Energy South Carolina        | 2021 |
| The Brattle Group, et al.           | A National Assessment of Demand Response Potential                           | Federal Energy Regulatory Commission  | 2009 |
| Duke Energy Progress                | EnergyWise Business FAQs   | Duke Energy Progress                  | 2019 |
|                                     | Demand Response Automation Program   | Duke Energy Progress                  | 2020 |
| Dominion Energy North Carolina      | Schedule 10: Large General Service   | Virginia Electric and Power           | 2019 |
| Enel X                              | Tennessee Valley Authority (TVA) Demand Response: Frequently Asked Questions | Tennessee Valley Authority (TVA)      | 2021 |

### 12.2.1 Demand Response and Load Types

Demand Response strategy is generally defined by several dimensions, including utility load needs, unique characteristics of the customer segment including size and hours of operation, available end-use equipment, and possible control strategy. Nonresidential customers vary considerably in terms of their size, energy using equipment comprising their load, as well as timing of their operation. In general, electric load from the nonresidential sector contributes heavily to winter morning peak with key contributing end uses being heating, water heating, lighting, and refrigeration and process equipment. Depending on the customer segment, not all of these end uses easily lend themselves for DR purposes. Table 74 breaks down common commercial and industrial load types and highlights which DR technologies and programs are best tailored to them.

Table 74. Commercial Demand Response/Energy Efficiency Measures across Load Types

| Load type*        | Smart Thermostats | Water Heater Direct Load Controls | Energy Management System Load Control | Automated Demand Response | Rates and Tariffs (TOU, RTP, DPP, CPP, PTR) | Voluntary Demand Response |
|-------------------|-------------------|-----------------------------------|---------------------------------------|---------------------------|---|---------------------------|
| Lighting          |                   |                                   | ✓                                     | ✓                         | ✓   | ✓                         |
| Water heating     |                   | ✓                                 | ✓                                     | ✓                         | ✓   | ✓                         |
| Space heating     | ✓                 |                                   | ✓                                     | ✓                         | ✓   | ✓                         |
| Process Equipment |                   |                                   |                                       | ✓                         | ✓   | ✓                         |

\*This is not an exhaustive list of all commercial and industrial load types.

The DR technologies outlined in include:

- **Smart thermostats.** Smart thermostat technology is a powerful tool in curtailing heating demand during peak times during the winter. As previously mentioned, commercial heating is a primary contributor to increased demand during the mid-morning hours of a typical load shape curve. By incentivizing C&I customers to install smart thermostats and enroll in DR programs, utilities can reduce peak demand by directly controlling the temperature at which buildings are heated during critical hours or events<sup>30</sup>. Notably, with larger commercial and industrial facilities controlling heating load with the help of energy management systems, smart thermostats is a technology more suitable for small business customers.
- **Water heater direct load controls.** Load control equipment placed on water heaters can help reduce water heating load during the times of peak demand. Notably, with larger commercial and industrial facilities controlling water heating load with the help of energy management systems, water heater controls is a technology more suitable for small business customers.
- **Energy management system load control.** Energy management systems is a powerful solution to deploying effective load control strategies across multiple systems in a way that is automated and scalable across multiple facilities. This load control strategy has a potential of delivering deep and predictable load reductions.
- **Automated demand response.** Automated demand response allows for direct access and control of energy using systems using a pre-determined schedule and control strategy. This strategy frequently leverages energy management systems as gateway to controlling commercial facility's peak load leveraging a variety of end uses, including heating and lighting.
- **Rates and tariffs.** Rate and pricing programs such as Time-of-Use Rates (TOU), Real-Time Pricing (RTP), Dynamic Peak Pricing (DPP), and Critical Peak Pricing (CPP) are effective ways of changing C&I customer behavior as it relates to their energy usage<sup>31</sup>. Rate based programs offer lower pricing during off peak hours thus shifting load from peak to off-peak times. Tariff-based products such as interruptible tariff design require participating customers to reduce peak demand to a specific level (firm service level) during specific demand response events, as opposed to on a continuous basis. Most of the rate and tariff offerings are end-agnostic and offer participants the flexibility to craft their own load shifting or load reduction strategy.

<sup>30</sup> Specian, Mike, et al.

<sup>31</sup> Nandy, Paulomi, et al.

- **Voluntary demand response.** Voluntary demand response programs are generally enduse-agnostic and offer participants the freedom to develop their custom load curtailment strategy with consideration of energy systems at their facilities as well as available for reduction peak load.

## 12.2.2 Existing Demand Response Programs

The following subsections detail several examples of winter demand response programs offered by Southeastern utilities. The winter DR programs discussed in this review are detailed in Table 75.

Table 75. Winter Demand Programs

| Utility                          | Program/pilot                      | Type  | Seasonal peak             |
|----------------------------------|------------------------------------|---|---------------------------|
| Duke Energy Progress             | EnergyWise® Business               | Commercial smart thermostat and switch technology | Winter peaking            |
| Duke Energy Progress             | Demand Response Automation Program | Automated DR                                      | Winter peaking            |
| Tennessee Valley Authority (TVA) | TVA-Enel X Demand Response Program | Interruptible tariff with eligible equipment      | Winter peaking            |
| Dominion Energy North Carolina   | Large General Service TOU Program  | TOU rates   | Summer Peak / Winter peak |

### Duke Energy Progress EnergyWise® Business Program

SMC customers in DEP service territory are eligible to participate in the EnergyWise® Business Program, a direct load control program where high-energy equipment is automatically switched on and off to conserve energy in exchange for tiered rebates. DEP provides customers with no-cost outdoor switches or indoor smart Wi-Fi thermostats that attach to HVAC systems such as AC units and electric heat pumps. During what DEP classifies as "conservation periods," the utility will automatically "cycle" these connected systems to reduce energy consumption during periods of high demand in the summer and winter months<sup>32</sup>. The rebate amount given to the customer per event is determined by the percent cyclability of each controllable system, or the percentage of time the equipment is cycling instead of fully operating during a conservation event. In the winter period from March to November, customers are offered an additional \$25 per thermostat they install in addition to the usual cycle-determined rebate amount. What is unique about this program is that it allows businesses flexibility with regard to how much they want to reduce the operation of their HVAC systems, while also maintaining the incentive to increase their level of participation via energy reduction.

### Duke Energy Progress Demand Response Automation Program

In addition to their EnergyWise® Business Program, DEP's DR Automation Program offers various incentives to nonresidential customers in the C&I and governmental sectors capable of curtailing demand by at least 50 kW during peak events, both in the summer and the winter. Participation in the program starts off as a five-year contract and includes a minimum of one curtailment event in the summer and a maximum of 10 throughout the year<sup>33</sup>. DEP outlines the peak periods when curtailment events are likely to occur as weekdays during 1 – 9pm from June – September (summer) and weekdays during 5 – 11am and 4 – 9pm from December – February.

<sup>32</sup> Duke Energy Progress.

<sup>33</sup> "Demand Response Automation Program." *Duke Energy Corporation*.



For an example facility that has contracted to curtail demand by 500 kW during a peak event, they could earn up to \$27,500 in credits and incentives during their first year of participation by just participating in one curtailment event<sup>34</sup>. This calculation includes a one-time participation incentive, a monthly credit for having the contract, and an event performance credit. If the facility were to participate in additional events throughout the winter season, they would earn additional performance credits.

Participation in curtailment events either occurs manually or via remote control by DEP after an on-site visit and installation of respective electrical equipment<sup>35</sup>. This could include several different technologies, including smart thermostats or smart meters, automated HVAC controls, etc.

### **Tennessee Valley Authority (TVA)-Enel X Demand Response Program**

The TVA-Enel X Demand Response Program offers eligible commercial, institutional, and industrial customers in TVA service territory the opportunity to enroll in their year-round interruptible tariff program, where customers agree on a predetermined decrease in energy consumption when called on by the utility to do so in exchange for rebates throughout the year. TVA conducts a preliminary reduction potential assessment and installs AMI and direct control metering devices at the property on high-energy consuming equipment such as lighting, HVAC systems, and refrigeration systems<sup>36</sup>. Once officially enrolled, TVA can call upon customers anytime between 5:00 am - 8:00 pm amid "abnormally high electricity demand" to reduce their energy consumption by the agreed upon amount<sup>37</sup>. Depending on the setup, the customer will either manually dial back these systems or the utility will automatically do so via communication through its Network Operations Center.

### **Dominion Energy North Carolina Large General Service TOU Program**

In 2019, Dominion Energy North Carolina implemented a TOU rate structure for large nonresidential customers that require 500 kW of power or more per day. Customers are charged according to these rates on a monthly billing cycle during specified days and seasons. In both the summer and winter, there are three different types of day classifications, marked A, B, and C, for which there are different on-peak and off-peak rates. The greatest difference between rates is for A-classified days during both seasons, where the on-peak rate per kWh is 27.6242 cents during 6 am - 1 pm and 5 pm - 10 pm, and the off-peak rate per kWh is 11.1861 cents during the same time frames.<sup>38</sup> These are days when the utility anticipates high demand, such as an incoming cold snap. The utility notifies customers the day before so that they have time to prepare energy usage for the following day. While the other programs that have been discussed involve some level of voluntary participation, the rates set here are involuntary; these larger customers must shift their energy usage to different times if they want to avoid the fixed higher costs.

## **12.3 Opinion Dynamics Commercial Demand Response Study**

As part of this market study, the team explored customer interest and likelihood to engage with select DR solutions suitable for curtailing load during the winter peaks. The potential DR programs were a Smart Thermostat Program and a TOU Rate Program.

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<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> Enel X.

<sup>37</sup> Ibid.

<sup>38</sup> Dominion Energy North Carolina.

### 12.3.1 Smart Thermostat DR Program

The Study Team asked small businesses that had a compatible central heating/cooling system a battery of questions regarding smart thermostats. Note that results for this battery of questions are only overall and not presented by usage category as only small businesses qualified to receive these questions.

The Study Team asked respondents if they had heard of smart thermostats prior to being surveyed. Table 76 presents the percentage of respondents who indicated hearing of smart thermostats before.

- Overall awareness of smart thermostat technology, with only 11% of small business respondents indicating they had never heard of it.

Table 76. Heard of Smart Thermostat

|         | n  | Heard of smart thermostats |
|---------|----|----------------------------|
| Overall | 84 | 89%                        |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling

The Study Team asked those respondents who indicated they had heard of smart thermostats if they had any installed at their business, those who indicated they had never heard of smart thermostats were assumed to not have one installed. The Study Team asked respondents who indicated they had a smart thermostat if it was in use. Table 77 presents the percentage of respondents who had a smart thermostat and the percentage of smart thermostats specified as in use.

- Few small business respondents indicated having a smart thermostat, with only 19% indicating there was a smart thermostat in their facility.
- Almost all (96%) of respondents who indicated there was a smart thermostat in their facility indicated it was in use.

Table 77. Presence of Smart Thermostat and Usage Status

|         | n     | Has smart thermostat | Smart thermostat in use |
|---------|-------|----------------------|-------------------------|
| Overall | 16-84 | 19%                  | 96%                     |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling (and with smart thermostat installed for “Smart thermostat in use”)

The Study Team asked those with an in use smart thermostat how often it was in use. Table 78 presents the percentage of respondents who indicated each amount of time.

- Most respondents with a smart thermostat in their small business facility indicated it was in use “All of the time” (86%).

Table 78. Time Smart Thermostat Is in Use

|         | n  | All of the time | Some of the time | Rarely |
|---------|----|-----------------|------------------|--------|
| Overall | 15 | 84%             | 6%               | 0%     |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling and smart thermostat installed



The Study Team asked respondents with smart thermostats what their thermostat controlled. All respondents with a smart thermostat indicated it controlled both heating and cooling.

The Study Team asked respondents who had heard of a smart thermostat but did not have one if they had ever considered replacing their existing thermostat with a smart thermostat. The Study Team assumed that respondents who had never heard of a smart thermostat had never considered switching to one. Table 79 presents the percentage of respondents who previously considered switching to a smart thermostat.

- Of small business respondents who did not have a smart thermostat in their facility, only 20% indicated they had considered replacing their existing thermostat with a smart thermostat.

**Table 79. Replacing Existing Thermostat with Smart Thermostat**

|         | n  | Considered Replacing<br>Thermostat with Smart<br>Thermostat |
|---------|----|---|
| Overall | 59 | 20%   |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling without a smart thermostat

The Study Team asked respondents who considered switching to a smart thermostat in the past but did not end up installing one why they did not move forward in the process. Table 80 presents the percentage of respondents who indicated each reason.

- The top reason small business respondents indicated they had not moved forward with smart thermostat installation was that they never got to it because it was not a priority (37%). Respondents also indicated that it costs too much (16%) and gave a range of other reasons (27%). Fewer respondents indicated they were waiting for their current thermostat to stop working (8%), had technical issues that prevented installation (6%), or were waiting for smart thermostat technology to get better (5%).

**Table 80. Reasons for Not Replacing Existing Thermostat with Smart Thermostat**

|         | n  | Never Got to<br>It - Not A<br>Priority | Other | Costs<br>Too<br>Much | Waiting For My<br>Current Thermostat<br>to Stop Working | Technical Issues -<br>Could Not Install | Waiting For<br>Technology to Get<br>Better |
|---------|----|--|-------|----------------------|---|---|--|
| Overall | 13 | 37%                                    | 27%   | 16%                  | 8%  | 6%                                      | 5%   |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling who considered replacing their existing thermostat with a smart thermostat but did not move forward with the process.

## Smart Thermostat DR Program Adoption Results

Table 81 displays the adoption curve current estimates for the winter Smart Thermostat DR Program broken down by business category. As mentioned previously, these adoption curves are based on initial results and assumptions from the commercial phone survey. The Study Team will work with the potential model team to ensure these curves fit within the assumptions and needs of the model inputs.

- Overall and across business category, there was not a large increase in adoption rate between incentive levels. The annual incentives did not drastically impact respondents' willingness-to-participate.

Adoption is affected by customers financial and non-financial barriers as well as their program awareness. Increasing awareness will increase adoption estimates. Moreover, there are a few steps to increase participation in a program like the Smart Thermostat DR program: (1) increase smart thermostat penetration, (2) increase program awareness, (3) reduce barriers to participation, especially when it comes to uncertainty around the program participation process, data security, and the program's effects on facility operations. Additional details on customer barriers follow in the next table (Table 81).

**Table 81. Smart Thermostat Program Business Adoption Curve Results**

|                          | n  | Incentive |                          |                          |
|--------------------------|----|-----------|--------------------------|--------------------------|
|                          |    | \$0       | Annual Incentive of \$50 | Annual Incentive of \$75 |
| Overall                  | 15 | 20%       | 21%                      | 24%                      |
| <b>Business category</b> |    |           |                          |                          |
| Small business           | 15 | 20%       | 21%                      | 24%                      |
| Medium/large business    |    |           |                          |                          |

Note: Results based on phone survey data—small businesses with compatible central heating/cooling and a smart thermostat that controls heating

The Study Team asked respondents to rate potential barriers to winter Smart Thermostat Program participation on a scale of 1 “Not a barrier” to 5 “Extreme barrier.” Table 82 presents the mean score for each potential barrier broken down by business category.

- Allowing utilities to control the facility's thermostat (3.22), potential negative impacts on facility operations (3.48), and data security concerns due to thermostat's Wi-Fi connection (2.76) had the highest mean scores across barriers to participation

**Table 82. Barriers to Smart Thermostat Program Participation**

|         | n  | Concerns About Allowing Your Utility to Control Thermostat(S) During Events | Knowledge About the Program Participation Process | Data Security Due to The Thermostat's Wi-Fi Connection | The Cost of a Smart Thermostat | Potential Negative Impacts on Comfort | Potential Negative Impacts on Facility Operations | Cannot Change Heating Usage in the Winter |
|---------|----|---|---|--|--------------------------------|---------------------------------------|---|---|
| Overall | 16 | 3.22  | 2.06  | 2.76   | 1.92                           | 2.58                                  | 3.48  | 2.32                                      |

Note: Results based on phone survey data – small businesses with compatible central heating/cooling and a smart thermostat

### 12.3.2 Time-of-Day Rate Program

Another potential option to manage winter load is a TOU program, referred to in the web survey as a Time-of-Day Rate Program. Unlike the Smart Thermostat Program, TOU programs rely on the initiative of the customers to actively modify their energy usage behavior.

The Study Team asked respondents to rate a series of potential barriers to winter participation on a scale of 1 to 5 where 1 was “Not at all a barrier” and 5 was “Extreme barrier.” Table 83 presents the mean scores for each barrier broken down by business category.

- The need to use electricity mostly during peak hours (3.17), the cost of electricity during the peak period (3.06), and potential negative impact on facility operation (2.89) had the highest mean scores

across barriers to participation. This indicates that business' ability to modify their energy usage to avoid peak times without affecting their facility operation is a major barrier to program participation.

Table 83. Barriers to Winter Time-Of-Day Rate Program Participation

|                          | n   | The Cost of Electricity During the Peak Period | Lack Of Knowledge About the Program Participation Process | Lack Of Knowledge About When You Use Electricity | Need to Use Electricity Mostly During Peak Hours | Potential Negative Impacts on Comfort | Potential Negative Impacts on Facility Operations |
|--------------------------|-----|--|---|--|--|---------------------------------------|---|
| Overall                  | 177 | 3.06   | 2.50  | 2.35   | 3.17   | 2.77                                  | 2.89  |
| <b>Business category</b> |     |  |   |  |  |                                       |   |
| Small business           | 155 | 3.07   | 2.50  | 2.34   | 3.19   | 2.78                                  | 2.90  |
| Medium/large business    | 22  | 2.84   | 2.42  | 2.41   | 2.91   | 2.62                                  | 2.74  |

Note: Results based on phone survey data—all respondents who indicated their business/organization either occupied all or part of their facility

### Time-of-Day Rate Program Adoption Results

Table 84 displays the adoption curve current estimates for the winter Time-of-Day Rate Program broken down by business category. Commercial adoption curves for the summer Time-of-Day rate Program can be found in Appendix B. As mentioned previously, these adoption curves are based on initial results and assumptions from the commercial phone survey. The Study Team will work with the potential model team to ensure that these curves fit within the assumptions and needs of the model inputs.

- Overall and across business categories adoption showed consistent growth as the off-peak rate decreased.
- Adoption for medium/large businesses trended higher than adoption for small businesses across all off-peak rate scenarios.

Table 84. Winter Time-of-Use Business Adoption Curve Results

|                          | n   | Off-Peak Rate               |                             |                             |                             |
|--------------------------|-----|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                          |     | 3% Lower Than Current Rates | 4% Lower Than Current Rates | 6% Lower Than Current Rates | 8% Lower Than Current Rates |
| Overall                  | 148 | 8%                          | 10%                         | 14%                         | 19%                         |
| <b>Business category</b> |     |                             |                             |                             |                             |
| Small business           | 133 | 7%                          | 9%                          | 13%                         | 18%                         |
| Medium/large business    | 15  | 13%                         | 16%                         | 20%                         | 29%                         |

Note: Results based on phone survey data—all respondents who indicated their business/organization either occupied all or part of their facility

### 12.3.3 Custom DR Program

The Study Team asked large businesses questions related to a theoretical Custom DR Program. However, there was insufficient sample size to calculate a meaningful adoption curve (n=2). Of the two large businesses with Custom DR willingness-to-participate data, one stated they were "Not at all likely" to participate in such a program at any incentive level. The second respondent indicated they were "Not at all likely" to participate

without an incentive, “Somewhat likely” to participate if there were an incentive of \$25 or \$50 per KW load reduction, and “Moderately likely” to participate if there were an incentive of \$100 per KW load reduction. Despite the first respondent indicating they were not likely to participate regardless of incentive, they also categorized all potential barriers presented as “Not a barrier,” but just that they had no interest in participating. The second respondent indicated four of the five potential barriers as an “Extreme barrier:” facility’s electric load is too small, facility does not have the systems that can reduce load, negative impacts on comfort and negative impacts on operations. The respondent indicated the fifth barrier, knowledge of the participation process, was “Somewhat of a barrier.”

### 12.3.4 Managed Electric Vehicle Charging

The Study Team asked businesses with EV charging stations questions related to managed EV charging. However, there was insufficient sample size to calculate a meaningful adoption curve (n=2). Of the two businesses with managed EV charging data, one stated they were “Not at all likely” to participate in such a program at any off-peak charging rate whereas the other indicated they were “Extremely likely” to participate at any off-peak charging rate. The divergent attitudes of the two respondents are reflected in their rating of each of the barriers to participating in such a program. The second respondent who indicated that they were “Extremely likely” to participate rated four of the six barriers as “Somewhat of a barrier,” including the cost of electricity during the peak period, knowledge of the participation process, knowledge of electricity use, and negative impacts on comfort. This respondent also rated negative impacts on operations as a “Moderate barrier” and the need for electricity during peak hours as an “Extreme barrier.” The first respondent who indicated that they were “Not at all likely” to participate rated all barriers as an “Extreme barrier.”

## 12.4 Conclusion

For nonresidential customers as the workday begins and lighting, HVAC, and other C&I systems go live, demand for electricity rapidly increases. With these load shape characteristics in mind, utilities can begin to pinpoint the best ways to address peak periods of demand on the grid. DESC’s commitment to installing AMI for all meters in its service territory over the next few years will greatly widen the scope of DR capabilities. As a part of the literature review, the Study Team identified four types of DR interventions that can be leveraged to manage winter peak demand: (1) DLC technologies; (2) weatherization strategies to improve the building envelope and bolster savings; (3) automated DR; and (4) rate and pricing programs, such as TOU Rates, RTP and CPP, that encourage customers to consume energy during cheaper time periods by increasing the price per KWH of electricity during times of peak or critical peak demand.

The Study Team gathered information from commercial customers on their awareness of DR program designs and interest in DLC programs and TOU programs. Barriers to DLC participation included concerns about allowing outside control of their thermostat (mean of 3.22 on a scale of 1 “Not a barrier” to 5 “Extreme barrier”), negative impacts on facility operations (mean of 3.48) and data security (mean of 2.76). Barriers to TOU participation included the costs of electricity during peak periods (mean of 3.06 on a scale of 1 “Not a barrier” to 5 “Extreme barrier”), need to use electricity during peak hours (mean of 3.17) and potential negative impacts on facility operations (mean of 2.89).

## **Appendix A. Detailed Penetration, Saturation, and Building Characteristics**

Detailed Penetration, Saturation, and Building Characteristics workbook delivered as separate Appendix attachment.

## Appendix B. Summer Time-of-Day Results

Table 85. Summer Time-of-Day Commercial Adoption Curve Results

|                          | n   | Off-Peak Rate               |                             |                             |                             |
|--------------------------|-----|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                          |     | 3% Lower Than Current Rates | 4% Lower Than Current Rates | 6% Lower Than Current Rates | 8% Lower Than Current Rates |
| Overall                  | 148 |                             | 13%                         | 17%                         | 21%                         |
| <b>Business category</b> |     |                             |                             |                             |                             |
| Small business           | 133 | 9%                          | 12%                         | 17%                         | 21%                         |
| Medium/large business    | 15  | 17%                         | 22%                         | 25%                         | 26%                         |

Note: Results based on phone survey data – all respondents who indicated their business/organization either occupied all or part of their facility

## Appendix C. Survey Instruments and Interview Guides

### SMB Community Leader IDI Instrument:



DESC Market  
Characterization Con



DESC Market Study  
Commercial Phone St

## Appendix D. Small Business Secondary Research Sources

This appendix summarizes the literature review sources and eleven utilities the team reviewed.

Table 86. Small Business Deep Dive Literature Review Sources

| Author                   | Title   | Sponsor                                | Year |
|--------------------------|---|--|------|
| A. Dreobl, and K. Tanabe | Extending the Benefits of Nonresidential Energy Efficiency to Low-Income Communities                              | ACEEE                                  | 2019 |
| S. Nowak                 | Big Opportunities for Small Business: Successful Practices of Utility Small Commercial Energy Efficiency Programs | ACEEE                                  | 2016 |
| K. Funk                  | Small Business Energy Efficiency: Roadmap to Program Design   | ACEEE                                  | 2012 |
| Opinion Dynamics         | Ameren Missouri Program Year 2019 Annual EM&V Report  | Ameren Missouri                        | 2020 |
| Opinion Dynamics         | PY2013–14 Third Party Commercial Program Value and Effectiveness Study Report (Volume II)                         | California Public Utilities Commission | 2016 |
| Opinion Dynamics         | Assessment of Partnerships with Community-Based Organizations   | California Public Utilities Commission | 2021 |
| Opinion Dynamics         | Interstate Power and Light Company: Small Business Energy Solutions Process Evaluation Report                     | Interstate Power and Lighting Company  | 2021 |
| Opinion Dynamics         | PSE Commercial Pay for Performance Pilot Literature Review Findings   | Puget Sound Energy                     | 2018 |
| Research Into Action     | Spotlight on Key Program Strategies from the Better Buildings Neighborhood Program: Final Evaluation Vol. 6       | US Department of Energy                | 2015 |

## References

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Dreobl, Ariel, and Kate Tanabe. 2019. “Extending the Benefits of Nonresidential Energy Efficiency to Low-income Communities.” ACEEE. November, 2019.

Funk, Kristen. 2012. “Small Business Energy Efficiency: Roadmap to Program Design.” ACEEE. 2012.

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<https://bge.agentisenergy.com/client>, Last Accessed: May 2. 2022.

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*Small Business Secondary Research Sources*

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<https://www.energysmartnola.info/small-biz-kits/>. Last Accessed: May 2. 2022.

<https://www.oncor.com/takealoadofftexas/pages/small-business>. Last Accessed: May 2. 2022.

<https://www.sba.gov/funding-programs>. Last Accessed: May 2.2022.

<https://www.scsbdc.com/links-and-resources>. Last Accessed: May 2.2022.

<https://www.togethersch.org/>. Last Accessed: May 2.2022.

Table 87. Small Business Offerings from Reviewed Utilities

| Utility   | SDBI      |                        |                               |                                 | Enhanced Small Business Incentives | Business Online Store | Virtual Commissioning | Business Energy Reports |
|---|-----------|------------------------|-------------------------------|---------------------------------|------------------------------------|-----------------------|-----------------------|-------------------------|
|   | Lighting  | Refrigeration Controls | Thermostats and HVAC Controls | Food Service Equipment Controls |                                    |                       |                       |                         |
| Alliant Iowa  | ✓         | ✓                      |                               |                                 |                                    |                       |                       |                         |
| Ameren Illinois Company                                 | ✓         | ✓                      | ✓                             | ✓                               | ✓                                  | ✓                     |                       |                         |
| BGE   | ✓         | ✓                      | ✓                             |                                 | ✓                                  | ✓                     | ✓                     | ✓                       |
| Commonwealth Edison                                     | ✓         | ✓                      |                               |                                 | ✓                                  |                       | ✓                     |                         |
| Consumers Energy  | ✓         | ✓                      |                               |                                 |                                    |                       |                       | ✓                       |
| Duke Energy Progress                                    | ✓         | ✓                      |                               |                                 | ✓                                  |                       |                       |                         |
| Entergy   | ✓         | ✓                      |                               |                                 |                                    |                       |                       |                         |
| National Grid   | ✓         | ✓                      |                               |                                 | ✓                                  | ✓                     |                       |                         |
| Oncor   | ✓         | ✓                      |                               |                                 |                                    |                       |                       |                         |
| Pacific Gas & Electric                                  | ✓         | ✓                      |                               |                                 |                                    | ✓                     | ✓                     |                         |
| <b>Total Number of Utilities that Include Offerings</b> | <b>10</b> | <b>10</b>              | <b>2</b>                      | <b>1</b>                        | <b>5</b>                           | <b>4</b>              | <b>3</b>              | <b>2</b>                |

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